

A SYNOPSIS OF THE GENERA *MNESARETE* COWLEY,
BRYOPLATHANON GEN. NOV., AND
ORMENOPLEBIA GEN. NOV.
(ODONATA: CALOPTERYGIDAE)

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ABSTRACT. This synopsis of the exclusively South American genus *Mnesarete* includes keys to both sexes based primarily on morphology of the caudal appendage in males and the posterior margin of the prothorax and intersternite in females, diagnoses, distribution maps, and diagnostic illustrations. Two new genera, *Bryoplathanon* (type species: *Lais globifer* Hagen in Selys) and *Ormenophlebia* (type species: *Lais imperatrix* McLachlan) are described. The following nomenclatural changes are proposed: *M. regina* (Ris), *M. rollinatti* (Martin), and *M. saltuum* (Ris) are transferred to *Ormenophlebia*; and *Hetaerina borchgravi* Selys and *H. fuscibasis* Calvert are transferred to *Mnesarete*. Seven new species (*M. drepane*, *M. ephippium*, *M. lencionii*, *M. loutoni*, *M. machadoi*, *M. rhopalon*, and *M. williamsoni*) are described. A generic key to all New World Calopterygidae and a discussion of the generic concepts of *Hetaerina* and the 24 species of *Mnesarete* are presented, and descriptions for the last larval stadium of *M. grisea* and *O. imperatrix* are provided.

RESUMEN. Una sinopsis de los géneros *Mnesarete* Cowley, *Bryoplathanon* gen. nov. y *Ormenophlebia* gen. nov., con claves y descripciones de siete especies nuevas (Odonata: Calopterygidae). La presente sinopsis del género *Mnesarete*, exclusivamente sudamericano, incluye claves para ambos sexos basadas principalmente en la morfología de los apéndices caudales de los machos y del margen posterior del protórax e intersternito de las hembras, diagnosis, mapas de distribución e ilustraciones diagnósticas. Dos nuevos géneros, *Bryoplathanon* (especie tipo: *Lais globifer* Hagen en Selys) y *Ormenophlebia* (especie tipo: *Lais imperatrix* McLachlan) son descritos. Los siguientes cambios nomenclatoriales son propuestos: *M. regina* (Ris), *M. rollinatti* (Martin), y *M. saltuum* (Ris) son transferidas a *Ormenophlebia*; y *Hetaerina borchgravi* Selys y *H. fuscibasis* Calvert son transferidas a *Mnesarete*. Siete nuevas especies (*M. drepane*, *M. ephippium*, *M. lencionii*, *M. loutoni*, *M. machadoi*, *M. rhopalon*, y *M. williamsoni*) son descritas. Se proporciona una clave para todos los géneros de Calopterygidae de América, se discuten los conceptos genéricos de *Hetaerina* y *Mnesarete*, y se describen los últimos estadios larvales de *M. grisea* y *O. imperatrix*.

INTRODUCTION

Odonata of the family Calopterygidae are relatively large, conspicuous damselflies of riverine ecosystems occurring on all continents except Australia and Antarctica. Eighteen genera representing at least 167 species are known, of which 73 occur in the New World. Largely because of their colorful metallic blue, green, or cupreous bodies and patterned wings, a few have been the subject of intense studies of behavior (Alcock, 1983; Bick and Sulzbach, 1966; Cordoba-Aguilar, 1994a, 1994b; Eberhard, 1986; Erickson and Reid, 1989; Grether, 1996a, 1996b, 1997; Grether and Gray, 1996; Johnson, 1961, 1962a, 1962b, 1963; Waage, 1972, 1975, 1978, 1979a, 1979b, 1979c, 1980, 1984, 1988). Sixty-eight of the 73 species belong to the exclusively Neotropical subfamily Hetaerinae. Its members are easily recognized by a unique combination of characters: reticulated midbasal space, anterior margin of quadrangle convex, and cercus with a distal fossa. Many of its members are common and are found in any collection of Neotropical Odonata. Species resolution has always been difficult due to the numerous names in the literature, lack of access to type material, and overall similar-

ity among species. The inadequate taxonomic knowledge has probably hindered further ecological and behavioral studies for these Neotropical species.

In my synopsis of the New World genus *Hetaerina* (Garrison, 1990) I treated all previously described species and described four new ones. Of 77 names proposed for members of this speciose genus, I considered 37 as valid and transferred two species (*Hetaerina borchgravi* Selys and *Hetaerina fuscibasis* Calvert) to *Mnesarete* Cowley. I also discussed the difficulty in discriminating between *Hetaerina* and *Mnesarete*, stating that "The two genera have long been considered separate, though no single or combined morphological characters separate them" (Garrison, 1996:179) and "Further research on *Mnesarete*, now in progress, may necessitate a shift of some species to other new genera." (Garrison 1990:180)

Here I treat the Neotropical components currently placed in the poorly known genus *Mnesarete* Cowley. I describe two new genera and provide a comprehensive key to the New World genera of Calopterygidae. All members of this family (except *Calopteryx* Leach and *Hetaerina* Hagen in Selys) are confined to South America.

Taxonomic works treating *Mnesarete* have traditionally paralleled that described for *Hetaerina* by Garrison (1990). The first species were included in Hagen's "sous-genre *Laïs*" in 1853. The genus

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Table 1 Names used or associated with *Mnesarete* and current disposition of each.

Name	Reference	Original genus	Current status (M. = <i>Mnesarete</i>)	Type status	Location of type
<i>aenea</i>	Selys 1853	<i>Lais</i>	<i>M. aenea</i>	Lectotype ♂	HC
<i>astrape</i>	De Marmels 1989	<i>Mnesarete</i>	<i>M. astrape</i>	Holotype ♂	MIZA
<i>borchgravii</i>	Selys 1869	<i>Hetaerina</i>	<i>M. borchgravii</i>	Syntypes ♂ ♀	IRSNB, MCZ
<i>cupraea</i>	Selys 1853	<i>Lais</i>	<i>M. cupraea</i>	Holotype ♂	BMNH
<i>devillei</i>	Selys 1879	<i>Lais</i>	<i>M. devillei</i>	Lectotype ♂	BMNH
<i>drepane</i>	Garrison this paper	<i>Mnesarete</i>	<i>M. drepane</i>	Holotype ♂	FSCA
<i>ephippium</i>	Garrison this paper	<i>Mnesarete</i>	<i>M. ephippium</i>	Holotype ♂	UMMZ
<i>fulgida</i>	Selys 1879	<i>Lais</i>	<i>M. fulgida</i>	Lectotype ♂	BMNH
<i>fuscibasis</i>	Calvert 1909	<i>Hetaerina</i>	<i>M. fuscibasis</i>	Lectotype ♂	CM
<i>globifer</i>	Hagen in Selys 1853	<i>Lais</i>	<i>Bryoplathanon globifer</i>	Lectotype ♂	MCZ
<i>grisea</i>	Ris 1918	<i>Lais</i>	<i>M. grisea</i>	Lectotype ♂	FNS
<i>guttifera</i>	Selys 1873	<i>Lais</i>	<i>M. guttifera</i>	Lectotype ♂	IRSNB
<i>hauxwelli</i>	Selys 1869	<i>Lais</i>	<i>M. hauxwelli</i>	Holotype ♂	BMNH
<i>hincksi</i>	Fraser 1946	<i>Mnesarete</i>	<i>M. metallica</i>	Holotype ♂	BMNH
<i>hyalina</i>	Hagen in Selys 1853	<i>Lais</i>	<i>M. hyalina</i>	Holotype ♂	NHMW
<i>imperatrix</i>	McLachlan 1878	<i>Lais</i>	<i>Ormenophlebia imperatrix</i>	Lectotype ♂	BMNH
<i>lencionii</i>	Garrison this paper	<i>Mnesarete</i>	<i>M. lencionii</i>	Holotype ♂	FLC
<i>loutoni</i>	Garrison this paper	<i>Mnesarete</i>	<i>M. loutoni</i>	Holotype ♂	USNM
<i>machadoi</i>	Garrison this paper	<i>Mnesarete</i>	<i>M. machadoi</i>	Holotype ♂	MNRJ
<i>marginata</i>	Selys 1879	<i>Lais</i>	<i>M. marginata</i>	Holotype ♂	BMNH
<i>mariana</i>	Machado 1996	<i>Mnesarete</i>	<i>M. mariana</i>	Holotype ♂	ABMM
<i>metallica</i>	Selys 1869	<i>Lais</i>	<i>M. metallica</i>	Syntypes ♂ ♀	lost?
<i>phryne</i>	Costa 1986	<i>Mnesarete</i>	<i>M. pudica phryne</i>	Holotype ♂	MNRJ
<i>pruinosa</i>	Hagen in Selys 1853	<i>Lais</i>	<i>M. pruinosa</i>	Syntypes ♂ ♀	ZMHU
<i>pudica</i>	Hagen in Selys 1853	<i>Lais</i>	<i>M. pudica pudica</i>	Syntypes ♂ ♀	NHMW, ZMHU
<i>regina</i>	Ris 1918	<i>Lais</i>	<i>Ormenophlebia regina</i>	Lectotype ♂	FNS
<i>rhopalon</i>	Garrison this paper	<i>Mnesarete</i>	<i>M. rhopalon</i>	Holotype ♂	MNRJ
<i>rollinati</i>	Martin 1897	<i>Lais</i>	<i>Ormenophlebia rollinati</i>	Syntypes ♂ ♀	MNHP (lost?)
<i>saltuum</i>	Ris 1918	<i>Lais</i>	<i>Ormenophlebia saltuum</i>	Lectotype ♂	FNS
<i>scintilla</i>	Ráčenis 1968	<i>Mnesarete</i>	<i>M. cupraea</i>	Holotype ♂	MIZA
<i>smaragdina</i>	Selys 1869	<i>Lais</i>	<i>M. smaragdina</i>	Lectotype ♂	IRSNB
<i>williamsoni</i>	Garrison this paper	<i>Mnesarete</i>	<i>M. williamsoni</i>	Holotype ♂	UMMZ

was revised by Selys (1854) and included freehand illustrations of the appendages of four species (*Lais aenea* Selys, *Lais globifer* Hagen in Selys, *Lais pruinosa* Hagen in Selys, and *Lais pudica* Hagen in Selys) by Hagen. Further descriptions of new species, redescrptions, corrections, and additions by Selys and Hagen followed in 1869, 1873, 1879, and 1880. Ris (1918) described four new species and presented keys to five inhabiting the Andean cordillera of South America. Cowley (1934b) replaced the preoccupied name *Lais* with *Mnesarete*. Fraser (1946), in an attempt to determine certain species described by Selys, did more to confuse than clarify the situation. For example, his illustrations of the appendages of *Mnesarete hincksi* Fraser refer to *Mnesarete metallica* (Selys), those of *Mnesarete hauxwelli* (Selys) to *Mnesarete fulgida* (Selys), and those of *Mnesarete cupraea* (Selys) to *Mnesarete devillei* (Selys). Costa (1986) provided a detailed and thorough treatment of one species, *Mnesarete pudica* Hagen in Selys. Other papers (Calvert, 1909; De Marmels, 1989; Machado, 1996; Ráčenis, 1968) have included isolated descriptions of new species.

Past recognition and association of specimens to the 32 currently applied names (Table 1) within *Mnesarete* have been difficult due to paucity of specimens in collections, lack of direct comparison to type material, and lack of comparative illustrations. I examined type material for all taxa except for *Mnesarete hincksi* Fraser, *Lais metallica* Selys, *Mnesarete mariana* Machado, *Lais rollinati* Martin, and *Mnesarete scintilla* Ráčenis.

METHODS AND MATERIAL

KEYS

The likelihood for the discovery of new species of *Mnesarete* is high. I have, therefore, broken the keys to males and females of this large genus into subordinate keys which should more easily allow for the inclusion of new species when they are discovered. The subordinate keys are not meant to imply natural (phylogenetic) groupings.

DESCRIPTIONS

Each species account includes a synonymy, description (if new species), etymology (if new species), diagnosis, distri-

bution, remarks, biology, type data, and material examined. Synonymies include only references that incorporate original descriptions, name changes, misidentifications, or supplementary and/or significant data.

ILLUSTRATIONS

All illustrations were executed with the aid of a camera lucida using a Wild M-8 Stereomicroscope. Wing illustrations are from scanned specimens and images were edited with Micrografx Picture Publisher 10®.

MEASUREMENTS AND TERMINOLOGY

Ranges of measurements for paratype series were taken from 10 males and 10 females if available. Wing terminology follows Riek and Kukalová-Peck (1984) as modified by Bechly (1996); mandibular formulae of larvae follows that of Watson (1956); terminology of secondary genital structures follows Pfau (1971). According to Pfau (1971), the zygoteran "penis" should be called the **genital ligula**, and he recognizes two segments, not three as stated by Kennedy (1916). In the descriptions, **anx** = antenodal crossveins, **FW** = forewing, **HW** = hind wing. The following abbreviations are used for figure captions under species accounts: **app** = caudal appendages (cerci and associated parts), **ha** = anterior hamules, **li** = genital ligula (penis), **he** = head, **pth** = prothorax, **int** = intersternite, **th** = synthorax, **ab** = abdomen, **wi** = wings, **by** = body, and **mp** = map.

TERMS AND NAMES

Maps were created electronically from the Digital Chart of the World (1:1000000) using ArcView 3.2®. Elevation data and longitude and latitude coordinates for all material examined as well as verifiable records in the literature were culled from Brown (1941), Woytkowski (1978), De Marmels (1985), and the Global Gazetteer Web site (<http://www.calle.com/world/>), and placed into a Microsoft FoxPro database linked to the ArcView program. Throughout, I have tried to use current spellings for collection sites listed here but recognize that some of these may be incorrect.

MATERIAL

Material from the following collections, preceded by their acronyms, was examined or gleaned from published and unpublished records.

- ABMM** Angelo B.M. Machado, personal collection, Departamento de Zoologia, Instituto de Ciências Biológicas, Universidade Federal de Minas Gerais, Caixa Postal 486, BR-31270-901, Belo Horizonte, Minas Gerais, BRAZIL
- ARC** Andrew C. Rehn, personal collection, 2817 G Street, Apartment 1, Sacramento, CA 95816, U.S.A.
- BMNH** British Museum of Natural History, Department of Entomology, British Museum (Natural History), Cromwell Road, London SW7 5BD, U.K. (Stephen Brooks, Kelly Jackson)
- CC** Carl Cook, personal collection, 469

- Crailhope Road., Center, KY 42214, U.S.A.
- CM** Carnegie Museum of Natural History, Section of Entomology, 4400 Forbes Avenue, Pittsburgh, PA 15213, U.S.A. (John Rawlins, Robert Davidson)
- DRP** Dennis R. Paulson, personal collection, Slater Museum of Natural History, University of Puget Sound, 1500 North Warner, Tacoma, WA 98416, U.S.A.
- FLC** Frederico A.A. Lencioni, personal collection, Rua dos Ferroviários, 55-Jardim Mesquita, BR-12300-000, Jacareí, São Paulo, BRAZIL
- FML** Fundación e Instituto Miguel Lillo, Universidad Nacional de Tucumán, Miguel Lillo 251, 4000 San Miguel de Tucumán, ARGENTINA (Eduardo Dominguez)
- FNS** Forschungsinstitut und Naturmuseum Senckenberg, Senckenberganlage 25, D-60326, Frankfurt-am-Main, GERMANY (Heinz G. Schröder)
- FSCA** Florida State Collection of Arthropods, 1911 SW 34th Street, Gainesville, FL 32608-1268, U.S.A. (Bill Mauffray, Minter J. Westfall, Jr.)
- HC** Hope Collection, Oxford University Museum of Natural History, Parks Road, Oxford OX1 3PW, U.K. (Christopher O'Toole)
- IRSNB** Institut Royal des Sciences Naturelles de Belgique, 29, rue Vautier, B-1000 Bruxelles, BELGIUM (Jérôme Constant, P. Grootaert)
- JB** Jean Belle, personal collection, Onder de Beumkes 35, NL-6883 HC VELP, THE NETHERLANDS (now in RNHL)
- JJD** Jerrell J. Daigle, personal collection, 2067 Little River Lane, Tallahassee, FL 32311, U.S.A.
- KJT** Ken J. Tennessen, personal collection, 1949 Hickory Avenue, Florence, AL 35630, U.S.A.
- LACM** Entomology Section, Natural History Museum of Los Angeles, 900 Exposition Boulevard, Los Angeles, CA 90007, U.S.A. (B.V. Brown)
- LNK** Landessammlungen für Naturkunde, Erbprinzenstrasse 3, 76133, Karlsruhe, GERMANY (Gerhard Jurzitza)
- MCZ** Museum of Comparative Zoology, Harvard University, Cambridge, MA 02138, U.S.A. (David Furth, Philip Perkins)
- MIZA** Museo del Instituto de Zoología Agrícola "Francisco Fernández Yépez," Maracay, VENEZUELA (Jürg De Marmels)
- MLP** Departamento Científico de Entomología, Museo de La Plata, La Plata, ARGENTINA (Javier Muzón, Natalia von Ellenrieder)
- MNHP** Museum National d'Histoire Naturelle, Paris, Laboratoire d'Entomologie, 45, rue

- Buffon, F-75005, Paris, FRANCE (Jean LeGrand)
- MNRJ Museu Nacional, Departamento de Entomologia, Museu Nacional, University Federal Rio de Janeiro, Quinta da Boa Vista, BR-20942-040, Rio de Janeiro, BRAZIL (Janira Costa)
- NHMW aturhistorisches Museum Wien, Vienna, AUSTRIA (Ulrike Aspöck)
- NVE Natalia von Ellenrieder, personal collection, Entomology Section, Natural History Museum of Los Angeles, 900 Exposition Boulevard, Los Angeles, CA 90007, U.S.A.
- RNHL Rijksmuseum van Natuurlijke Historie, Department of Entomology, Rijksmuseum van Natuurlijke Historie, Raamsteeg 2, Postbus 9517, NL 2300 RA Leiden, THE NETHERLANDS (Jan van Tol)
- RWG Rosser W. Garrison, personal collection, California Department of Food & Agriculture, 3294 Meadowview Road, Sacramento, CA 95832-1448, U.S.A.
- SWD Sidney W. Dunkle, personal collection, Biology Department, Collin County Community College, Spring Creek Campus, Plano, TX 75074, U.S.A.
- TWD Thomas W. Donnelly, personal collection, 2091 Partridge Lane, Binghamton, NY 13903, U.S.A.
- UMMZ University of Michigan, Museum of Zoology, 1109 Geddes Avenue, Ann Arbor, MI 48109-1079, U.S.A. (Mark O'Brien)
- USNM National Museum of Natural History, Smithsonian Institution, Washington, DC 20560, U.S.A. (Oliver S. Flint, Jr.)
- ZMHU Zoologisches Museum, Humboldt Universität, 1040 Berlin, Invalidenstrasse 43, GERMANY (Kurt K. Günther)

SYSTEMATICS

BIOLOGY

Little is known of the biology of any species. I have extracted notes from locality labels and included comments from collectors who have written to me on the behavior of certain species.

IMMATURE STAGES

The descriptions I include here for the larvae of *Mnesarete* (*M. grisea* (Ris)) and *Ormenophlebia* gen. nov. (*O. imperatrix* (McLachlan)) are the first for members of these two genera. The larva of *Bryoplathanon* gen. nov. has not been described.

CHARACTERS

Most of the characters used in evaluating specific status for *Mnesarete* are the same as for *Hetaerina* and reference should be made to Garrison (1990).

The following additional characters are used in the keys that follow.

Males

THORAX. The thorax in all male *Mnesarete* is predominantly metallic red or green with narrow pale lines along the thoracic sutures (Fig. 99). One species, *M. grisea* (Ris), is an exception in having dark metallic green areas restricted to the anterior portion of the thorax (Fig. 101).

WINGS. The wings in most members of the three genera treated here are hyaline, often with flashes of blue iridescence comparable to some Old World Calopterygidae (*Phaon* Selys and *Vestalis* Selys). Two species (*Mnesarete cupraea* and *M. devillei*) often have a narrow stripe of brown along the second antenodal space (Fig. 112) and males of *M. pruinosa* (Hagen in Selys) and some *M. lencionii* Garrison have varying amounts of a milky white area at the base of the wings (Fig. 116). The apical wing spot is variable but can be used as a diagnostic character for *M. borchgravii* (Selys) (Fig. 111).

The posterior margin of HW at vicinity of CuA in *Mnesarete loutoni* Garrison is sinuous in both sexes (Fig. 115). All species but two, *M. borchgravii* and *M. lencionii*, lack a pterostigma. Species of *Ormenophlebia* are unique in possessing a dimorphic condition in the pterostigmata between FW and HW; absent (as in Fig. 110c) to small (Fig. 110a) in FW, a large polygon in HW (Fig. 110a, b) of males; in females absent in FW (Fig. 110c) and a small to medium quadrangle in HW (Fig. 110d).

ABDOMEN. Accessory genitalia in males offer useful characters in discriminating among genera and, in some cases, among species. A prominent, upright hairy tubercle on the medial sternal portion of abdominal segment is present in *Bryoplathanon* (Fig. 33a–c) but is planar in other genera or, at most, forms a low transverse ridge in some *Ormenophlebia* (e.g., Figs. 36, 38). The genital lobe on abdominal segment 2 is interspecifically variable in *Ormenophlebia* (Figs. 35–38) but is uniform in *Mnesarete* (e.g., Fig. 39). Hamular morphology aids in separating the three genera treated here; the anterior hamule is a thin, bladelike structure in *Ormenophlebia* (Fig. 34a, b), elongate and bluntly rounded in *Bryoplathanon* (Fig. 33d), and narrowly linear in *Mnesarete* (Fig. 40). The shape and structure of the genital ligula allows for the separation of *Bryoplathanon* (with a prominent horn on base of segment 1; Fig. 41a) from *Mnesarete* and *Ormenophlebia* (both lacking a horn; Fig. 134b). The shape of the distal part of the genital ligula (segment 2) is remarkably uniform throughout the three genera; it is transverse in two species, *Mnesarete fuscibasis* (Calvert) and *M. pudica* (Figs. 131b, 134b), and emarginate in all other species of the three genera treated here (Figs. 42b, 44b, 45b, 46b). Rudimentary apical lobes, first reported by Kennedy (1916), and later noted by Bechly (1996), and fully illustrated by Costa (1986), are present in

M. pudica (Fig. 134b) and also the closely related *M. fuscibasis* (Fig. 131b). Some species (e.g., *M. hauxwelli*; Fig. 45) have microtrichia along the distal margin of the apical segment.

The middorsal carina on abdominal segment 10 terminates in a sharp spine surpassing the margin of the segment in some species (Fig. 21). In others, the spine is abbreviated (Fig. 28), keellike, or absent (Fig. 104).

CAUDAL APPENDAGES. The shape of the cercus is so distinctive that identification of almost all species can be easily accomplished through comparison with the illustrations (Figs. 1–32). The cercus in *Mnesarete* displays a greater range of morphological differences and size than within *Hetaerina*. Generalized characters are shown in Fig. 6a and were discussed by Garrison (1990). A stiff cluster of bristles is present at the base of the cercus in a few species (Figs. 7, 9–13). The paraproct consists of a medial and a distal process. The medial process (basomesal process from Garrison [1990]) is most often rudimentary (e.g., Fig. 6b) but is well developed in *Bryoplatthanon* (Fig. 1b, c) and *Ormenophlebia* (Figs. 2–5) and some species of *Mnesarete* (e.g., Fig. 15). The distal process (called inferior appendage in older literature) ranges from rudimentary (Figs. 11d, 13d, 18d) to 0.60 or more the length of the cercus (e.g., Figs. 1–10). The tip of the distal process is variously armed, but in most species it is truncate with two or three small dorsal recurved teeth (e.g., Figs. 20d, 21d).

Females

Unlike the males, I have discovered few reliable characters with which to discriminate among many species. Despite the great differences manifested in the caudal appendages of males of several metallic red and green species, females within these groups approach one another closely. The characters elaborated below appear subtle and may not always work.

HEAD. Coloration of the frons and postclypeus is useful in characterizing a few species (*Mnesarete loutoni* and *Mnesarete astrape* De Marmels).

THORAX. The presence (Fig. 49) or absence (Fig. 48) of a propleural spot located at the anterior end of the notopleural suture and presence of a prothoracic horn (Fig. 67) are helpful in separating closely related red metallic species. The shape of the hind lobe of the prothorax (Figs. 50–62, 67–69, 71, 72), though variable, provides the best discriminatory characters among metallic red species pairs. However, I have identified some of these females by supposition (based on presence of co-occurring males) and am unsure if I have correctly differentiated between intraspecific and interspecific differences.

The dorsal end of the intersternite (Figs. 74–98), so important in discriminating among most females of *Hetaerina*, is less informative in *Mnesarete*. In all but a few species it is dark, linear, and possesses

a poorly developed anterior shoulder (Figs. 78, 79, 82–86, 88a, 90–94, 97, 98). In two species (*M. grisea* and *M. pruinosa*) the tip is explanate, bilobate, and pale (Figs. 87, 95) and in *M. hauxwelli* it is dark with two subequal lobes (Fig. 89). Differences are difficult to detect within most species, but I have attempted to illustrate four or five examples for each species taken from the limited number of females. Unfortunately, little bona fide (e.g., collected in tandem or in copula) material has been available, and caution should be used in assigning some females to species based on the key. Further comments about the intersternite are made under the species accounts.

The overall color pattern of the synthorax (metallic red, blue, or green) and extent and configuration of dark thoracic stripes allows for separation among species groups (Figs. 100–103). Coloration and shape of the various stripes are subject to individual as well as ontogenetic variation.

WINGS. As with males, the presence of a pterostigma is diagnostic for *Mnesarete borchgravii* and *M. lecionii*. Other differences in ratios of greatest wing width to wing length allow for the separation of *M. fuscibasis* and *M. pudica* (Figs. 113, 117) from other species (e.g., Figs. 112, 115, 118).

ABDOMEN. As in the male, the anterior lamina on abdominal segment 1 forms a prominent, upright, hairy tubercle in *Bryoplatthanon* (Fig. 33a–c) but is inconspicuous in other genera. The middorsal carina on abdominal segment 10 terminates in a sharp spine surpassing the margin of the segment in some species (Fig. 21c). In others, the spine is abbreviated (Fig. 28c), keellike, or absent (Fig. 104). The armature along the posterior margin of abdominal segment 10 provides useful characters such as presence or absence of smaller supplementary dorsolateral spines (Figs. 106–108).

KEY TO GENERA OF CALOPTERYGIDAE OF THE NEW WORLD

The following key should allow for placement of most individuals of New World Calopterygidae. Keys to the five species of North American *Calopteryx* are found in Westfall and May (1996).

- 1 Midbasal space without crossveins (Fig. 121) 2
- 1' Midbasal space with crossveins (Fig. 122) 3
- 2 (1) IR₂ merging with RA near vicinity of distal end of quadrangle then diverging posteriorly to upper sector of arculus (RP) in the form of an oblique vein two to six cells distal to arculus (Fig. 124), tip of male cercus with no tuft of bristles; Nearctic North America *Calopteryx*
- 2' IR₂ paralleling RA briefly before bending posteriorly and ending on upper sector of arculus (RP) (Fig. 125), tip of male cercus

- with a tuft of bristles (Figs. 30, 31); Venezuela, Guyanas (Fig. 144) *Iridictyon*
- 3 (1') Abdominal segment 1 with anterior lamina of both sexes in lateral view forming a prominent, upright, hairy tubercle (Fig. 33a-c); SE Brazil (Fig. 144)
..... *Bryoplathanon* gen. nov.
- 3' Abdominal segment 1 with anterior lamina inconspicuous in lateral view, lacking a tubercle, or forming at most a low transverse ridge (e.g., Figs. 35-39) 4
- 4 (3') Larger metallic green species, abdomen longer than 60 mm in male (Fig. 129a) and 45 mm in female (Fig. 129b); male with genital lobe prominent, clearly differentiated from anterior part of abdominal segment 2 (Figs. 35-38); cercus of male in lateral view angulate at distal half (Figs. 2c, 3c, 5c); pterostigmata of FW and HW dimorphic, in males absent (as in Fig. 110c) to small in FW (Fig. 110a), a large polygon in HW (Fig. 110a, b); in females absent in FW (Fig. 110c) and a small to medium quadrangle in HW (Fig. 110d); mountainous regions of Colombia south through Bolivia (Fig. 144)
..... *Ormenophlebia* gen. nov.
- 4' Smaller species, abdomen 42 mm or less in male, 39 mm or less in female; male with genital lobe not prominent, not clearly differentiated from anterior part of abdominal segment 2 (e.g., Fig. 39); cercus of male in lateral view linear or nearly so (e.g., Figs. 7c, 10c, 12c, 21c); pterostigmata, if present, not dimorphic in FW and HW, pterostigma in HW a normal quadrangle; Nearctic North America south through N Argentina 5
- 5 (4') Base of wings in male with some degree of red spotting (this may be confined to a red wash between red veins; *Hetaerina titia* (Drury) can be sometimes an exception); basal wing venation usually red, wing venation posterior to cubito-anal area usually (but not always) reticulate (Fig. 123) [note: two males of *Hetaerina aurora* Ris are an exception; see under "Discussion"]; thoracic pattern of both sexes mostly metallic red or green with wide pale tan areas between metallic markings of synthorax (figs. 66-72 in Garrison [1990]); SE Canada south through N Argentina
Hetaerina (see Garrison [1990] for keys)
- 5' Base of wings in male either hyaline, milky white (*Mnesarete lencionii* and *M. pruinosa*; Fig. 116), dark brown (most *M. fuscibasis*; Fig. 113a), or, if with red (*M. pudica*), then with wine red color extending beyond nodus (Fig. 117a); basal wing venation black [note: may be reddish in juveniles (recently eclosed adults)], wing venation posterior to cubito-anal area usually not strongly reticulate (Fig. 122) [note: *Mnesarete smaragdi-*

na (Selys) and *Mnesarete williamsoni* Garrison are exceptions; Fig. 118]; thoracic pattern of both sexes with metallic red, green, or gray encompassing most areas of synthorax resulting in pale tan areas limited to fine lines along thoracic sutures of synthorax (e.g., Figs. 99, 103) (except in *M. grisea*; Fig. 101); Venezuela, Colombia south through N Argentina (Fig. 145) *Mnesarete*

KEY TO SPECIES OF *IRIDICTYON*

- The two species of the South American genus *Iridictyon* Needham and Fisher are keyed and illustrated here but are not further discussed.
- 1 RP₂ arising at or before nodus (Fig. 126); male cercus with distal half only a little wider than basal half in mediodorsal view (Fig. 30a); wings of female hyaline (as in Fig. 119)
..... *Iridictyon myersi* Needham and Fisher
- 1' RP₂ arising distal to nodus (Fig. 127); male cercus with distal half about twice as wide as basal half in mediodorsal view (Fig. 31a); wings of female dimorphic, either hyaline or HW with a narrow milky band extending posterodistally beyond nodus (Fig. 120)
..... *Iridictyon trebbaii* Rácanis

Bryoplathanon new genus

Laïs Hagen in Selys, 1853:27 (in part, "1^{er} groupe: (L. HYALINA).")
Mnesarete: (in part) Davies and Tobin, 1984:12

TYPE SPECIES BY ORIGINAL DESIGNATION. *Laïs globifer* Hagen in Selys.

ETYMOLOGY. *Bryo*—Greek for swelling; *plathanon*, a neuter noun—Greek for plate. The generic name refers to the prominent midventral tubercle on abdominal segment.

DIAGNOSIS. The transference of *Mnesarete globifer* to a new genus is justified by two unique characters: the presence of a prominent, upright, hairy tubercle on the midventral portion of abdominal sternite 1 (Fig. 33a-c) and the prominent horn on segment 1 of the genital ligula (Fig. 41a). The large size and elongate abdomen is similar to *Ormenophlebia*, but in *Ormenophlebia* the pterostigmata of FW and HW are dimorphic (Fig. 110), the male cerci are distinctly angulate in lateral view (Figs. 2-5), and the genital lobes are prominent (Figs. 35-38).

DESCRIPTION. Large metallic green Neotropical calopterygids with long abdomen. Sexes dimorphic in relative length of abdomen (Fig. 128).

Head as in *Mnesarete* but larger and with occipital tubercles moderately developed; prothorax and synthorax as in *Mnesarete*; intersternite (Fig. 74) of female black, with well-developed anterior shoulder slightly deflexed from body, posterior lobe curved cephalad; legs long, typical of Calopterygidae; wings (Fig. 109) as in *Mnesarete* but longer, hyaline, venation black, 23-29 antenodals in FW,

22–26 in HW, anal area with two rows of cells, pterostigma lacking; FW tip hyaline, a well-defined brown apical spot on HW; two rows of cells behind CuA in FW and HW; CuA descending posterodistally from tip of CuP and largely paralleling MP, this area enclosing mostly one row of cells at base.

Abdomen long in male (64–69 mm; Fig. 128a), shorter in female (42 mm; Fig. 128b); both sexes with prominent hairy midventral tubercle on venter of abdominal segment 1 slightly convex anteriorly, in male (Fig. 33a, b) rounded posteriorly and with a U-shaped sulcus laterally, in female less prominent and with narrow arm extending to anterolateral margin of sternite (Fig. 33c). Anterior hamule (Fig. 33d) erect in ventral view, broadly truncate at both ends and with medial margin sinuous. Genital ligula (Fig. 41) with well-developed dorsal horn at base of segment 1, distal portion of segment 1 with bristles; segment 2 as in *Mnesarete*, with lateral lobes well developed and distal margin emarginate. Cercus of male (Fig. 1) linear, medial lobe poorly developed, bluntly triangular; anterior portion of superior ridge strongly developed, as long as abbreviated distal fossa; paraproct with well-developed digitlike medial process as long as planar distal process, its tip acutely rounded and lacking teeth. Abdominal segment 10 in female armed with middorsal spine surpassing tip of segment, no accessory dorsolateral spines; ventrolateral margin of segment 10 with one spine.

DISTRIBUTION. As for species (see *Bryoplathanon globifer* (Hagen in Selys) new combination).

REMARKS. The larva has apparently been collected (Carvalho and Nessimian, 1998) but has not yet been described.

Bryoplathanon globifer (Hagen in Selys)
new combination

Figs. 1 (app), 33 (ha), 41 (li), 74 (int), 109 (wi),
128 (by), 146 (mp)

Laïs globifer Hagen in Selys, 1853:27 (description from at least one pair from “Brésil (Nouv.-Fribourg)”)

Mnesarete globifer: Davies and Tobin, 1984:12

DIAGNOSIS. Both sexes are easily recognized by the prominent, moundlike swelling on the venter of abdominal segment 1 (Fig. 33a–c). In addition, the unusual morphology of the male appendages (Fig. 1), long abdomen (Fig. 128a), and presence of a horn near the base of segment 1 of the genital ligula (Fig. 41b) are unique.

TYPES. I examined eight male and two female syntypes in the MCZ and six males in the IRSNB, all with similar labels. In order to clarify application of the name, I designate as LECTOTYPE a male with the following data: “Neu Freiburg Rio/Beschre,” “*L. globifer*/ * Hag.,” “Hagen [printed],” “Draw; photo/ Montgomery/ 1961.” MCZ 12060.

DISTRIBUTION (Fig. 146). The distribution of *Bryoplathanon globifer* encompasses a restricted area from S Minas Gerais State (Morro do Ferro,

Poço Caldas, 20°46'S 44°35'W [Santos, 1966:66]) to central Rio de Janeiro State (Nova Friburgo, 22°16'S 42°32'W) and E São Paulo State (Campos do Jordão, 22°44'45"S 45°34'47"W [Costa *et al.*, 2000]).

REMARKS. This species appears to be rare in collections; I have seen only 20 males and four females. The largest series was apparently those available to Hagen (Hagen in Selys, 1854) who had 70 males and two females.

BIOLOGY. Frederico Lencioni (*in litt.*) offers the following notes regarding the habits of this rare species (abstracted): “. . . sighted six times at Campos de Jordão, only a male was collected. [Their flight is] high (more than 4m), fast, strong and wavy (typical of Calopterygidae), but . . . one specimen landed only few inches above the ground.” and “The locality is a mountain forest with *Podocarpus lamberti* Klotz, *Araucaria angustifolia* Kuntze, tree-fern (the great majority covered by *Zygopetalum maxillare* Loddiges), the locality is extremely cold and humid. Other species collected were *Forcepsioneura sancta* (Hagen in Selys), *Heteragrion* sp. nov., *Oxyagrion brevistigma* Selys, *Oxyagrion simile* Costa, and *Oxyagrion santosi* Martins.”

OTHER MATERIAL EXAMINED. BRAZIL: Minas Gerais State, Morro do Ferro, Poço Caldas, 1541 meters, 20°46'0"S 44°34'W, Feb., 1 ♀ (ABMM); Rio De Janeiro State, 17 on Petropolis-Teresopolis Rd., 19 Apr. 1977, (C.M. & O.S. Flint, Jr.), 1 ♂, 1 ♀ (USNM); Petropolis, Mt. Mosello, 838 meters, 22°30'S 43°10'W, 5 Jan. 1969, (N. Dos Santos), 1 ♂ (RWG); São Paulo State, Condomínio Paradise, Campos do Jordão, 1750 meters, 22°42'28"S 45°35'15"W, 3 Mar. 2003, (F.A.A. Lencioni), 1 ♂ (RWG); same data, 4 Mar. 2003, (F.A.A. Lencioni), 1 ♂ (RWG); Fazenda do Bonito, S. da Bocaina, S. Jose do Barreiro, 523 meters, 22°37'S 44°34'W, no date, (Vulcano), 2 ♂, 1 ♀ (RWG); Nova Friburgo, 913 meters, 22°16'S 42°31'W, no date, (C. Beschke), 6 ♂ (IRSN); same data, 7 ♂, 2 ♀ (MCZ).

Ormenophlebia new genus

Laïs—McLachlan, 1878:85 (in part)

Mnesarete: (in part) Davies and Tobin, 1984:13

TYPE SPECIES BY PRESENT DESIGNATION.
Laïs imperatrix McLachlan.

ETYMOLOGY. *Ormeno*—Greek for stem; *phlebia*, a feminine noun—Greek for vein. The generic name refers to the long, narrow wings.

DIAGNOSIS. The transfer of *Mnesarete imperatrix* (McLachlan), *M. regina* (Ris), *M. rollinatti* (Martin), and *M. saltuum* (Ris) to a new genus is justified by four unique characters: pterostigmata of FW and HW dimorphic; in FW of males absent (as in Fig. 110c) to small (Fig. 110a) and in HW a large polygon (Fig. 110a); in FW of females absent, in HW a small to medium quadrangle; males with genital lobe prominent, clearly differentiated from

anterior part of abdominal segment 2 (Figs. 35–38); anterior hamule forming a linear semihyaline blade (Fig. 34a); male cercus angulate at distal half in lateral view (Figs. 2–5).

DESCRIPTION. Large metallic green species (abdomen 60–69 mm in male and 45–49 mm in female); Neotropical calopterygids of slender build and long abdomen. Sexes dimorphic.

Head brilliant metallic green, with occipital tubercles moderately developed; prothorax as in *Mnesarete* but with middle lobes pronounced, a curvilinear depression along medial margin of propleuron in both sexes (possible contact point for male paraproct on female), hind lobe of prothorax prominent, rounded or truncated laterally; intersternite (Figs. 75–77) of female black, with poorly developed (*Ormenophlebia saltuum* (Ris)) or prominent anterior shoulder (*O. imperatrix*), posterior lobe long, slightly curved cephalad; legs long, typical of Calopterygidae; wings (Fig. 110a) as in *Mnesarete* but longer, hyaline, venation black, 27–33 antenodals in FW, 23–29 in HW, anal area with two rows of cells, pterostigmata of FW and HW dimorphic, in males absent (as in Fig. 110c) to small in FW (Fig. 110a) and a large polygon in HW (Fig. 110a, b); in females absent in FW and a small to medium quadrangle in HW; wing tips hyaline; usually two, occasionally three, rows of cells behind CuA in FW and HW; CuA descending posterodistally from tip of CuP and diverging slightly before paralleling MP, this area enclosing mostly two rows of cells at base.

Abdomen long in male (60–69 mm), shorter in female (45–49 mm); venter of abdominal sternite 1 planar or forming a gently raised transverse ridge, venter of tergite with well-developed lobe (Figs. 35–38); genital lobe of segment 2 well developed, differentiated from anterior portion of tergite, lobe moderately convex (Figs. 35, 36) to semicircular (Fig. 37); anterior hamule (Fig. 34a, b) forming a thin, semihyaline blade strongly acuminate anteriorly, its medial margin linear. Genital ligula (Figs. 42, 43) lacking dorsal horn at base of segment 1, distal portion of segment 1 with bristles; segment 2 as in *Mnesarete*, with lateral lobes and distal margin emarginate. Dorsal margin of segment 10 in both sexes ending in a raised truncate carina not surpassing emarginate tip of tergite. Cercus of male (Figs. 2–5) angulate, medial lobe absent, anterior portion of superior ridge absent (Figs. 2, 4, 5) or developed as an angulate ridge (*Ormenophlebia regina* (Ris); Fig. 3), distal fossa small occupying distal 0.30 or less of cercus, dorsomedial portion of cercus prominently spinose and in one species (*Ormenophlebia rollinati* (Martin); Fig. 4) with strongly spinose warty process; paraproct with well-developed digitlike medial process, distal process interspecifically variable in length and shape, extending from 0.40 (Fig. 4) to as long as cercus (Figs. 2, 5), its tip digitlike (Fig. 5) to clublike (Fig. 2) or with two short branches, medial one bluntly pointed, distal one truncate or pointed (Figs. 3, 4). Ab-

dominal segment 10 in female armed with middorsal spine surpassing tip of segment, no accessory dorsolateral spines; ventrolateral margin of segment 10 with one spine.

DISTRIBUTION (Fig. 144). Mountainous regions of Colombia south through Bolivia.

REMARKS. As noted under various species' accounts, specimens are not well represented in collections except for small series of two species (*O. imperatrix* and *O. saltuum*). A few specimens in the major European museums are without precise data and some have been misidentified; these are discussed below. The larva of *O. imperatrix*, recently collected from Baeza, Ecuador, is described below.

BIOLOGY. Collector's notes under various species' accounts indicate that members of this genus perch on high (above 6 m) branches overhanging narrow streams.

KEY TO SPECIES OF ORMENOPHLEBIA

I advise caution when identifying females. Separation between females of *Ormenophlebia imperatrix* and *O. saltuum* is straightforward based on my examination of several females of both species. I have seen the only known female of *O. regina* (partially crushed teneral paralectotype), and I have not yet seen the only known female of *O. rollinati* housed in the Paris Museum.

- 1 Males 2
- 1' Females 5
- 2 (1) Paraproct shorter than cercus, extending 0.40 (Fig. 4) to 0.75 (Fig. 3) length of cercus, its tip blunt with two short branches, medial one bluntly pointed, distal one truncate or pointed; cordilleran region of Bolivia 3
- 2' Paraproct as long as cercus, its tip digitlike (Fig. 5) to clublike (Fig. 2); cordilleran region of Ecuador and Peru 4
- 3 (2) Genital lobe in lateral view strongly bulbous, semicircular, higher than anterior lamina (Fig. 37); paraproct short, extending to 0.40 of cercus; dorsal angulation of cercus forming a spinose warty process (Fig. 4); medial branch of paraproct tip capitate, distal one pointed *O. rollinati*
- 3' Genital lobe in lateral view moderately produced, as high as anterior lamina (Fig. 36); paraproct extending to 0.75 of cercus; dorsal angulation of cercus lacking a spinose warty process (Fig. 3); medial and distal branches of paraproct tip capitate *O. regina*
- 4 (2') Genital lobe semicircular, about as high as anterior lamina (Fig. 38); ventral margin of cercus notched; paraproct with tip abruptly bent medially, its tip digitlike (Fig. 5); cordilleran region of Peru (Fig. 148) *O. saltuum*

- 4' Genital lobe in lateral view gently raised posteriorly (Fig. 35); ventral margin of cercus entire (Fig. 2a, c); tip of paraproct in ventral view forming an enlarged, bulbous club (Fig. 2d); Colombia, Ecuador (Fig. 147) *O. imperatrix*
- 5 (1') Lateral margin of posterior lobe of prothorax broadly angulate (Fig. 64), anterior lobe of intersternite prominent, almost as large as posterior lobe (Fig. 75); Colombia, Ecuador (Fig. 149) *O. imperatrix*
- 5' Lateral margin of posterior lobe of prothorax smoothly curved (Figs. 65, 66); anterior lobe of intersternite vestigial, much smaller than posterior lobe (Fig. 76) or absent (Fig. 77). 6
- 6' (5') Lateral margin of posterior lobe of prothorax not prominent, meeting propleuron at approximately a straight line when viewed anterodorsally (Fig. 65) [caution: this character may not reliably diagnose females; only one teneral female known]; cordilleran region of Bolivia (Fig. 149) . . . *O. regina*
- 6' (5') Lateral margin of posterior lobe of prothorax prominent, meeting propleuron at an angle (Fig. 66); cordilleran region of Peru (Fig. 148) *O. saltuum*

***Ormenophlebia imperatrix* (McLachlan)
new combination**

Figs. 2 (app), 34 (ha), 35(ha), 64 (pth), 75 (int),
129 (by), 147 (mp), 135, 136a (larva)

Lais imperatrix McLachlan, 1878:85–86 (description of ♀ from Intaj, Ecuador); Ris, 1918:43 (description of 1♂ from Susumuco, Colombia)

Mnesarete imperatrix: Davies and Tobin, 1984:13

DIAGNOSIS. Males are easily distinguished from congeners by the morphology of the caudal appendages (long, clublike distal process of paraproct) as given in the key. The low but clearly pronounced genital lobe (Fig. 35) is not as prominent as those in *Ormenophlebia rollinatti* (Fig. 37) or *O. saltuum* (Fig. 38) but is similar to that of *O. regina* (Fig. 36). The lateral margin of the hind lobe of the prothorax in females and males is roundly angulate (as in Fig. 64), not smoothly curved as in the other known species (males of *O. regina*, *O. rollinatti*, and *O. saltuum*, and females of *O. regina* and *O. saltuum*; Figs. 65, 66). Female intersternite (Fig. 75) has a prominent anterior shoulder almost as long as posterior lobe (poorly developed shoulder in *O. regina* and *O. saltuum*; Figs. 76, 77).

TYPES. McLachlan (1878) originally described this species from four “tolerably mature” females from which a lectotype was designated by Kimmins (1969:305). I illustrate the lateral margin of the prothoracic posterior lobe (Fig. 77) of a paralectotype from the BMNH.

DISTRIBUTION (Fig. 147). *Ormenophlebia imperatrix* is the most northerly distributed representative of this genus, occurring from central Colom-

bia (Meta Dept., Quebrada Subsumes [near Guayabedal] above the Río Negro, approx. 4°13'N 73°49'W, see De Marmels [1985:84]) to the cordilleran region of Ecuador south to Zamora Chinchipe Province (Zamora, 4°52'S 79°9'W).

Unpublished notes by the late B.E. Montgomery show that he examined one male and two females identified as *Lais imperatrix* in the MNHP labeled “Perou” and “Museum Paris/coll R. Martin, 1920.” He states: “These specimens do not conform exactly to Ris’ [1918] division (key) of *imperatrix*, *saltuum*, and *regina* . . . the lobe on the margin of the genital pouch, as desc[ribed] . . . for *saltuum*; also appendages” and “These specimens will need further definition.” I have not seen these specimens but based on Montgomery’s comments, I suspect that these specimens represent *O. saltuum*. I have also examined a teneral male in the BMNH lacking abdominal segments 7–10 labeled “Rioja/Amazon” and identified as ?*Lais imperatrix* by D.E. Kimmins. This male is almost certainly *O. regina* and is discussed under that species.

REMARKS. The red-veined condition mentioned in the original description (“Wings hyaline, but having a slight reddish appearance in consequence of the reticulation being *wholly bright red* [*italics are McLachlan’s*], excepting the entire costal nerve which is black.”) is characteristic of teneral and juvenile specimens of this genus and of *Mnesarete* and should not be considered a diagnostic character.

This species appears to be the most common member of the genus in collections. I identified a series of specimens from Abitagua in Pastaza Prov., Ecuador (1°27'S 78°9'W, 1200 meters) collected by William Clarke-McIntyre during 1939–41 in the UMMZ. The species has recently (1980, 1997) been collected by J. Daigle, S.W. Dunkle, and K.J. Tennesen in Napo Prov. (small stream 5 km S of Baeza, 1796 m; small stream 17 km E of Cuyujúa on road to Chaco, both approx. 0°27'S 77°53'W). J. Daigle kindly supplied these notes on its biology: “Males not wary . . . act like *Calopteryx maculata* (Beauvois) in the USA. Young females with red[veined] wings perched 3–3.5 m high on small trees at head of openings on steep, narrow, and shady bedrock streams. Stream width about 3 m and 30 cm deep with rock, gravel and some mudholes. Restricted to high elevations in montane forest (1600–1800 m). Not seen with other *Mnesarete* spp. Seen with *Argia medullaris* Hagen in Selys, *Teinopodagrion setigerum* (Selys), and *Rhionaeschna brevicercia* (Muzón and von Ellenrieder, 2001).”

LARVA (last larval stadium specimens; some with swollen wing pads; Fig. 135a). Head in dorsal view (Fig. 135a, c) tan with posterolateral margin broadly convex; in lateral view (Fig. 135b) with postocular tubercle and with irregular longitudinal dark stripe posterior to compound eye. Antenna (Fig. 136a) approximately 1.5× longer than head, with seven segments, segment 1 the longest; prementum (Fig. 135d) petiolate, strongly projecting

medially with a strongly developed cleft extending to base of palp; when appressed extending to mesothoracic coxae, two premental setae, marginal setae zero, palpal setae two or three; palpal lobes gently convex (Fig. 135d) with three well-developed palpal teeth (Fig. 135e); mandibles (Fig. 135f, g) with following formula: L 12345 0 a^(m)b/R 12345 y a(m¹⁻ⁿ)b; denticulate pattern on right molar crest variable ($n = 6-10$). Thorax tan, with dark irregular lateral stripe (Fig. 135b), propleural tubercle prominent; legs tan with a pair of darker bands each on femur and tibia. Wing pads extending to middle of abdominal segment 4. Abdomen pale with slight longitudinal stripes on segments (Fig. 135a, h), small posterodorsal protuberances on abdominal segments 4-9, an abortive middorsal ridge on 10 (Fig. 135h); lateral spines variable, forming rounded to slightly acute short spines on segments 4-9, forming spines on 10 or 9 and 10. Gonapophyses not extending past segment 10; male cercus (Fig. 135i) smoothly angulate at basal 0.20. Dorsal lamella aborted in my specimens; lateral lamella (Fig. 135j) moderately long, margins almost parallel, with irregular patterns of dark gray occupying most of gill; lateral lamella 8-9 mm. Total length of larva excluding lamellae 25-27 mm.

Although the larvae I examined were not reared, their identification is assured by the pharate, blade-like anterior hamule in males characterizing this genus. Only two characters seem to reliably differentiate larvae of *Ormenophlebia* from those of *Mnesarete*: 1) the presence of small dorsal spines on abdominal segments 4-9 (Fig. 135h) (lacking in the only known larva for *Mnesarete* [*M. grisea*; Fig. 136g], and 2) the absence of a dorsal spine on abdominal segment 10 (Fig. 135h) (present in *M. grisea*; Fig. 136g).

Differentiation from *Hetaerina* is more problematic. The larva of *O. imperatrix* keys to *Hetaerina capitalis* Selys in Zloty *et al.* (1993) and Novelo-Gutiérrez (2000) by possessing two premental setae, lacking conspicuous spines on posterior margins of abdominal tergites 8 and 9, pointed pronotal tubercles, and posterior border of profemora lacking conspicuous spines. It differs from this species by possessing middorsal protuberances on abdominal segments 4-9. The only species of *Hetaerina* thus far described which possess middorsal abdominal protuberances on abdominal segments 1-9 are *Hetaerina cruentata* (Rambur) and *Hetaerina fuscoguttata* Selys (Novelo-Gutiérrez 2000; Zloty *et al.*, 1993). The absence of a middorsal protuberance on abdominal segment 10 is shared only with *H. cruentata*; the larva of *H. fuscoguttata* is stated by Zloty *et al.* (1993) to have "a raised group of mid-dorsal spines." Middorsal protuberances are lacking in the illustrations and descriptions of the following South American species: *Hetaerina auripennis* (Burmeister) (Santos, 1970a), *Hetaerina hebe* Selys (Santos, 1970a), *Hetaerina brightwelli* (Kirby) (Santos, 1972), and *Hetaerina caja dominula* Hagen in Selys (Geijskes, 1943). A dorsal pro-

tuberance on abdominal segment 10 (absent in *O. imperatrix*) is illustrated for *H. auripennis* (Santos, 1970a), *H. hebe* (Santos, 1970b), and *H. caja dominula* (Geijskes, 1943).

Described from 3 males and 4 females from Ecuador (1♂, 1♀, Napo Prov., Baeza, Río Machangara, 25 July 1996; 2♂, 3♀, stream 5 km S of Baeza, 20 Nov. 1997, all collected by K.J. Tennessen).

MATERIAL EXAMINED. COLOMBIA: Meta Dept., Quebrada Susumoco (near Guayabedal), above the Río Negro, 1242 meters, 4°13'N 73°49'W, Mar. 1911, (A.H. Fassl), 1♂, 1♀ (FNS); ECUADOR: Pichincha Prov., Intag (could refer to the Río Intag, WNW of the town of Otavalo, on the road to Selva Alegre), 1175 meters, 0°8'N 78°50'W, 1 Oct. 1839, (Clarence Buckley), 1 paralectotype ♀ (BMNH); Napo Prov., small stream 17 km E of Cuyujúa on road to Chaco, 1796 meters, 0°27'S 77°53'W, 21 Aug. 1980, (S.W. Dunkle), 1♂, 1♀ (RWG); small stream 5 km S of Baeza, 1796 meters, 0°27'S 77°53'W, 20 Nov. 1997, (K.J. Tennessen), 2♂ (RWG); Pastaza Prov., between Puyo and Mera, 1000 meters, 1°29'S 78°3'W, Feb. 1939, (Wm. Clarke-MacIntyre), 1♂ (UMMZ); same data but 13 Sept. 1939, 1♂ (UMMZ); same data but 1 Oct. 1939, 1♀ (UMMZ); Río Pastaza (watershed), 900 meters, 1°38'S 77°50'W, Apr. 1938, (William Clarke-MacIntyre), 1♂ (RWG); same data but May 1938, 1♂ (UMMZ); Abitagua, 1200 meters, 1°27'S 78°9'W, 11 Nov. 1936, (Wm. Clarke-MacIntyre), 1♀ (UMMZ); same data but 1 Oct. 1939, 1♀ (RWG); same data but 13 Sept. 1939, 1♂ (UMMZ); same data but 3 June 1940, 1♂ (RWG); same data but 16 May 1941, 1♀ (UMMZ); same data but 26 May 1941, 1♂ (RWG); same data but 22 July 1941, 1♂ (UMMZ); same data but July 1941, 1♀ (UMMZ); Zamora Chinchipe Prov., Zamora, 1255 meters, 4°52'S 79°9'W, 21 Oct. 1941, (David B. Laddey), 1♀ (UMMZ).

Ormenophlebia regina (Ris) new combination

Figs. 3 (app), 36 (ha), 42 (li), 65 (pth), 76 (int),
149 (mp)

Lais regina Ris, 1918:46-47, fig. 22 (description of 1♂ from Coroico and 1♂ and 1♀ from Río Zongo, Bolivia)

Mnesarete regina: Davies and Tobin, 1984:13

DIAGNOSIS. *Ormenophlebia regina* and *O. rollinati* are the only two species in which the male paraproct extends less than 0.75 the length of the cercus. They differ by the truncate tip of the paraproct in *O. regina* (Fig. 3d) compared to the acuminate tip in *O. rollinati* (Fig. 4b). The genital lobes on abdominal segment 2 also are different; a gently rising lobe as high as anterior lamina in *O. regina* (Fig. 36) compared to a prominently raised semicircular lobe in *O. rollinati* (Fig. 37). Appendage morphology and the roundly angulate hind lobe of the prothorax (Figs. 2, 64) easily distin-

guishes *O. imperatrix* from *O. regina* (Figs. 3, 65). Males of *O. saltuum* differ from *O. regina* by appendage morphology (Figs. 3, 5) and condition of the genital lobe (Figs. 36, 38). In *O. saltuum*, the genital lobe forms a well-developed semicircular lobe (though not as prominent as *O. rollinati*; Fig. 37) compared to the lower less-fully developed condition in *O. regina* (Fig. 36).

The only known female of *O. regina* appears to be the crushed teneral specimen from the Río Zongo. I have attempted to place it in the key based on the condition of the hind lobe of the prothorax (Fig. 65) but emphasize that additional specimens may require a change in this diagnosis.

TYPES. Ris (1918) described this species based on two males and a female but did not designate a holotype. The teneral male from Coroico, Bolivia is labeled as "Type" by Ris and also has a red label "Lecto-[in ink by an unknown hand]/Typus[printed]" affixed to the envelope. In order to clarify application of the name, I designate this specimen as LECTOTYPE. I illustrate the accessory genitalia of the first and second abdominal segments of the lectotype (Fig. 36b), lateral margin of the hind lobe of the prothorax (Fig. 65), and intersternite (Fig. 76) of the paralectotype female; both in FNS.

DISTRIBUTION (Fig. 149). *Ormenophlebia regina* is the most austral representative of this genus and is thus far known from the cordilleran region of west-central Bolivia (La Paz Dept., Río Zongo, approx. 800 m, approx. 16°7'S 68°2'W; Coroico, 1221 meters, 16°1'S 67°44'W) east to Cochabamba Dept. (Chapare Prov., small rocky stream 0.1 km E of Río Carmen Mayu, at km marker 363.4 going west on main highway between Villa Tunari and Cochabamba, 2822 meters, 17°8'40"S 65°43'50"W). Ris (1918) examined an incomplete male of *O. rollinati* collected at Coroico, indicating sympatry with *O. regina*.

REMARKS. This species is rare in collections. Aside from the type series described by Ris (1918), Ken Tennessen and Steve Valley each collected a male in Cochabamba Dept. on 19 Nov. 1999. As stated under *O. imperatrix*, a teneral male in the BMNH lacking abdominal segments 7–10 from "Rioja/Amazon" and identified as ?*Lais imperatrix* by D.E. Kimmins is almost certainly *O. regina*. It was collected with a juvenile male *O. rollinati* whose appendages I illustrate in this paper. The collection locality of these specimens is a mystery. I have found three locations for Rioja, in Peru. One (2°55'S 73°34'W) is a small village in eastern Loreto Dept. west of the Río Napo and lies at an elevation of 128 meters. The second (11°50'S 69°35'W) is a village in eastern Madre de Dios Dept. at an elevation of 284 meters. Both of these localities are in the Amazon Basin, which might explain the labels on these specimens. The third is stated to be in Moyobambo Prov., San Martín Dept., and lies at an altitude of 848 meters between the two tributaries of the Río Huallaga (Cowley,

1943a). However, all bona fide records of this genus indicate species occurring in mountainous regions above 750 m and I consider the first two localities unlikely for members of this genus. Since both *O. regina* and *O. rollinati* are thus far known with certainty only from Bolivia, I suspect the provenance of these specimens to be in the mountainous regions of Bolivia or southernmost Peru.

OTHER MATERIAL EXAMINED. BOLIVIA: [no further data], 25 May 1989, 1♂ (RWG); La Paz Dept., Río Zongo, 2822 meters, 16°7'S 68°2'W, 1913, (A.H. Fassel), 1 paralectotype ♀ (FNS).

Ormenophlebia rollinati (Martin) new combination

Figs. 4 (app), 37 (ha), 43 (li), 149 (mp)

Lais rollinati Martin, 1897:592–593 (description of 1♂ and 1♀ from "Bolivie")

Mnesarete rollinati: Davies and Tobin, 1984:13

DIAGNOSIS. Males of *Ormenophlebia rollinati* are distinguished from all other congeners by the unique morphology of the appendages (Fig. 4) and enlarged genital lobe (Fig. 37). Further comparisons are given under *O. imperatrix* and *O. regina*.

I have seen no females of this species and was unable to examine the types. According to J. LeGrand (personal communication 11 Aug. 1999), they could not be found in the MNHP.

TYPES. Male and female syntypes in MNHP but apparently lost.

DISTRIBUTION (Fig. 149). Known only from one locality in Bolivia (La Paz Dept., Coroico, 1221 meters, 16°10'S 67°44'W). Martin's types were collected from "Bolivie" and the status of the Rioja male from the BMNH illustrated here is discussed under *O. regina*.

REMARKS. Another rare species in collections. I have examined only two males (Coroico, Bolivia in FNS, and "Rioja" in BMNH). The only other specimens would seem to be the male and female syntypes from Bolivia.

MATERIAL EXAMINED. BOLIVIA: La Paz Dept., Coroico, 1221 meters, 16°10'S 67°44'W, 1913, (O. Garlepp?), 1♂ (FNS); [COUNTRY?]: "Rioja/Amazon," 1♂ (BMNH).

Ormenophlebia saltuum (Ris) new combination

Figs. 5 (app), 38 (ha), 66 (pth), 77 (int), 110 (wi), 148 (mp)

Lais saltuum Ris, 1918:44–45, fig. 20 (description of 2♂, 1♀ from Pozuzo, Peru)

Mnesarete saltuum: Davies and Tobin, 1984:13

DIAGNOSIS. Males and females of *Ormenophlebia saltuum* are diagnosed under *O. imperatrix* and *O. regina*.

TYPES. Ris (1918) described this species based on two males and a female from Pozuzo, Peru, but did not designate a holotype. A mature male la-

beled as "Type" by Ris also has a red label "Lecto-[in ink by an unknown hand]/Typus[printed]" affixed to the envelope. In order to clarify application of the name, I designate this specimen as LECTO-TYPE. In FNS.

DISTRIBUTION (Fig. 148). *Ormenophlebia saltuum* occurs in the cordillera of central Peru from Huánuco (vicinity of Pampa Hermosa, 897 meters, 9°2'30"S 76°0'35"W), Pasco (Pozuzo, 826 meters, 10°4'S 75°0'32"W; Oxapampa, 1800 meters, 10°34'S 75°24'W), Junín (Río Perené, approx. 827 meters, approx. 10°58'S 75°13'W; La Merced, Hacienda La Salud, 756 meters, 11°3'S 75°19'W), to Pampa de Huayuri Dept. (Chanchamayo, apparently along Río Pisco, 953 meters, 13°42'S 75°48'W).

BIOLOGY. Felix Woytkowski collected two males between 1 and 5 May 1935 in the vicinity of Pampa Hermosa, providing the following notes on one of the envelopes: "Very rare, seen only 2 specimens during 2 weeks. Sit upon leaves along bank on (in) a glade. Cautious, disturbed fly high up and alight upon leaves of trees" and "took more than 1 hour to take these 2 beautiful specimens. Killed with ether acet[ate]." The following penciled notes accompany a mature female without definite locality from La Mar Province ("Ayna" Forests, 1900 m, 13 May 1941 Felix Woytkowski): "Never saw this species before. Rare. In shady jungle upon bush along a brook."

OTHER MATERIAL EXAMINED. PERU: Huánuco Dept., vicinity of Pampa Hermosa, 897 meters, 9°2'30"S 76°0'35"W, 1–5 May 1935, (Felix Woytkowski), 2♂ (RWG, UMMZ); Junín Dept., Río Perené, 827 meters, 10°58'S 75°13'W, no date, (Dr. P. Martin), 1♂, 1♀ (BMNH); La Merced, Hda. La Salud, 756 meters, 11°3'S 75°19'W, 1931, (Juan de D. Rivas S.), 6♂, 3♀ (RWG, UMMZ); same data but 13 June 1931, 1♀ (UMMZ); Pampa de Huayuri Dept., Chanchamayo (apparently along Río Pisco), 953 meters, 13°42'S 75°48'W, no date, no collector, 1♂ (SWD); Pasco Dept., Oxapampa, 3025 meters, 10°34'S 75°24'W, 1932, (Dr. P. Martin), 1♂ (BMNH); Ayacucho Dept., La Mar Prov., "Ayna" Forests, 1900 meters, 13 May 1941, (Felix Woytkowski), 1♀ (UMMZ).

Mnesarete Cowley *sensu stricto*

Laïs Hagen in Selys, 1853:27

Mnesarete Cowley, 1934b:201 (new name for *Laïs* Hagen in Selys, a junior primary homonym of *Laïs* Gistel, 1848, in Tunicata)

TYPE SPECIES. *Laïs hyalina* Hagen in Selys, designated by Kirby (1890:103).

DIAGNOSIS. No unique characters define the genus as presently conceived. The genus is largely defined by medium size (abdomen 42 mm or less in male and 39 mm or less in female; Figs. 130, 132, 133), presence of crossveins in midbasal space (Fig. 124), possession of distinct distal fossa on cercus (Fig. 6a) (few exceptions), thick platelike ante-

rior hamule with truncate corners in male (Fig. 40) (these characters in common with *Hetaerina*), wing base completely hyaline (Figs. 113c, 114, 115, 118) (dark markings at wing base in *M. borchgravi* [Fig. 111], dark streak along second series of antenodals in mature males of some *M. cupraea* and *M. devillei* [Fig. 112], dark brown at basal 0.40 of male in Chapada populations of *M. fuscibasis* [Figs. 113a, 132a], basal white in males of *M. pruinosa* [Fig. 116] and some males of *M. lencionii*, and wine red on most of wing in *M. pudica* [Figs. 117a, 133]), venation not reticulate posterior to cubito-anal area (slightly so in *M. smaragdina* and *M. williamsoni*; Fig. 118), thoracic pattern of both sexes with metallic red, green, or gray encompassing most areas of synthorax resulting in pale tan areas limited to fine lines along thoracic sutures of synthorax (Figs. 99, 100, 103) (except in *M. grisea* [Fig. 101] and one juvenile *M. guttifera* [Fig. 102]); intersternite of females mostly dark, linear with vestigial anterior lobe (Figs. 78, 79, 82–86, 88a, 90–94, 96–98) (exceptions for few species, e.g., *M. borchgravi* [Fig. 80], *M. cupraea* [Fig. 81], *M. grisea* [Fig. 87], *M. guttifera* (Selys) [Fig. 88b–d], *M. hauxwelli* [Fig. 89], and *M. pruinosa* [Fig. 95]).

DESCRIPTION. Small to medium-sized Neotropical calopterygids with moderately long abdomen.

Head typically metallic to dull, usually with occipital tubercles; prothorax usually metallic and in some species with prothoracic horn (Figs. 67, 73), intersternite usually black, linear, and possessing a low anterior shoulder; synthorax usually metallic with light tan areas usually narrowly confined to sutures; legs long, typical of Calopterygidae; wings (Figs. 111–118) mostly hyaline, venation black, 15–31 antenodals in FW, 15–31 in HW, anal area with two rows of cells, pterostigma usually lacking but present in a few species; FW tip hyaline, similarly so in HW or with a well-defined brown apical spot; usually two rows of cells behind CuA in FW and HW; CuA descending posterodistally from tip of CuP and largely paralleling MP, this area enclosing usually one row of cells at base.

Abdomen slightly longer in male (31–42 mm) than in female (24–39 mm); both sexes lacking midventral tubercle on venter of segment 1; genital ligula lacking well-developed dorsal horn at base of segment 1, distal portion of 1 with bristles; segment 2 with well-developed lateral lobes and emarginated distal margin (transverse in *M. fuscibasis* and *M. pudica*; Figs. 132c, 134c); distal margin ciliate in some species. Cercus of male in lateral view linear (e.g., Figs. 7c, 10c, 16c, 26c, 28, 29c) to slightly arcuate (e.g., Figs. 21c, 23c, 24c), medial lobe poorly (e.g., Figs. 7a, 16a, 17a, 27a) to strongly developed (e.g., Fig. 10a), sharply triangular (e.g., Figs. 14a, 18a) to semicircular (e.g., Fig. 10a), anterior portion of superior ridge strongly (e.g., Fig. 19a) to poorly developed (e.g., Fig. 28a, b), distal fossa usually present; paraproct vestigial (e.g., Figs. 11d, 13d, 18d) to well developed (e.g., Fig. 12) and,

in one species, with a well-developed digitlike medial process (Fig. 15). Abdominal segment 10 in female with poorly developed carina not extending beyond segment margin (as in Figs. 104, 105) to middorsal spine surpassing tip of segment (Figs. 106–108), with (Fig. 106) or without (Figs. 107, 108) accessory laterodorsal spines; lateroventral margin of segment 10 with one to several spines (Figs. 106–108).

The larva for only one species, *M. grisea*, described here, is known.

DISTRIBUTION (Fig. 145). The genus is exclusively South American and occurs from 7°30'N 60°40'W (*Mnesarete cupraea*: Venezuela, Bolívar State, Bochínche, ENE of Tumeremo, at the boundary with Guyana [near Guasipati, El Callao]) west to 4°52'N 79°9'W (*Mnesarete hauxwelli*: Ecuador, Zamora Chinchipe Prov., Zumba, Río Zamora), east to 4°21'S 39°19'W (*Mnesarete cupraea*: Brazil, Ceara State, Mazanhão, Rio Maracaguare, ca. 80 km E of Caninde [Rio Gurupi]) and south to 31°46'S 52°20'W (*Mnesarete pruinoso*: Brazil, Rio Grande do Sul State, Pelotas).

KEY TO MALES OF MNESARETE

Comparison of doubtful specimens of *Mnesarete* to diagnostic illustrations and diagnoses should enable specific identification. In cases where there may be confusion with *Hetaerina*, I have tried to diagnose between these generic entities. Keys to *Hetaerina* are found in Garrison (1990).

- 1 Paraprocts vestigial (Figs. 11d, 13d, 18d), body brilliant metallic copper; Amazonian regions of Ecuador and Peru Key M-1
- 1' Paraprocts not vestigial, extending at least 0.25 or more the length of cercus (e.g., Figs. 7, 10, 15), body coloration variable 2
- 2 (1') Cercus with an apical lobe completely overlying and hiding distal fossa in mediodorsal view (Fig. 24a); hair present along venter of abdominal segments 7–10 (Fig. 105); S Venezuela, Ecuador (Fig. 155) *M. metallica*
- 2' Cercus lacking apical lobe, distal fossa visible in mediodorsal view (e.g., Fig. 6a); no hair along venter of abdominal segments 7–10 3
- 3 (2') A patch of dense, stiff bristles on basal 0.20 to 0.50 (Figs. 7, 9–13, 21–23) dorsal surface of cercus (Figs. 7, 9–13); body brilliant metallic copper or dark metallic blue Key M-2
- 3' Cercus lacking these bristles (e.g., Figs. 6, 8, 14–22) 4
- 4 (3') Body brilliant metallic copper, cercus narrow, medial lobe developed but small (Fig. 6); southeastern Peru, Pará south through Rondônia State in Brazil, N Bolivia (Fig. 152) *M. aenea*

- 4' Body brilliant metallic green to dark brown, or largely gray with various developments of white pruinosity; cercus more robust medially, medial lobe prominent (except *M. guttifera*, [Fig. 16a], *M. mariana* [Fig. 17a], *M. rhopalon* [Fig. 27]) and well differentiated from rest of cercus (e.g., Figs. 8, 28–29) 5
- 5 (4') With pterostigma [Note: one specimen lacking pterostigmata on two wings] 6
- 5' Without pterostigma 7
- 6 (5) FW tip hyaline, HW tip with an isolated brown spot not reaching wing margin (Fig. 111); superior ridge of cercus continuous along its entire length (Fig. 8); larger species (HW 33–40 mm; Fig. 130); São Paulo State in Brazil (Fig. 159) *M. borchgravi*
- 6' FW and HW tips hyaline; superior ridge of cercus interrupted with an isolated portion anterior to transverse ridge (Fig. 20); smaller species (HW 26–29 mm); São Paulo State in Brazil, Paraguay, Misiones Prov. in Argentina (Fig. 157) *M. lencionii*
- 7 (5') Paraproct in lateral view smoothly angulate at distal half, tip forming an enlarged club armed with small foliate lobes (Fig. 27a); Minas Gerais State in SE Brazil (Fig. 157) *M. rhopalon*
- 7' Paraproct in lateral view not angulate at distal half (except *M. williamsoni*; Fig. 29c), tip not forming an enlarged club; (Figs. 15a, 16a, 17a, 28a, 29a) 8
- 8 (7') Paraproct smoothly angulate in lateral view (Fig. 29c), tip narrowly spatulate (Fig. 29a, d); Pará State in Brazil (Fig. 154) *M. williamsoni*
- 8' Paraproct linear in lateral view (Fig. 28d), tip blunt and armed with two or more small recurved teeth (Figs. 19d, 28d), or forming a single medially recurved hook (Fig. 15), or pointed (Fig. 16) 9
- 9 (8') Tip of paraproct with two small subapical dorsal teeth followed by an apical long medioposteriorly directed acuminate tip (Figs. 16, 17); medial lobe of cercus absent; in mediodorsal view, a small lobe at basal 0.15 of medial margin of cercus (Figs. 16a, 17a); S Brazil, Paraguay (Fig. 158) [note: see under species discussion for status for *M. mariana* Machado] *M. guttifera*
- 9' Tip of paraproct blunt, armed with two or more small recurved teeth (Fig. 25a), or tip forming a single medially recurved hook (Fig. 15) 10
- 10 (9') Synthorax with posterior 0.5 of mesepisternum and anterior 0.5 of mesepimeron pale, dull dark metallic areas of synthorax confined to anterior 0.5 of mesepi-

- meron and posterior 0.5 of metepisternum (Fig. 101a) [note: some old males have these pale areas darkened so that entire mesothorax appears dark, but these darkened areas are not metallic], paraproct 0.5 length of cercus or more, its tip forming a single medially recurved hook (Fig. 15); S Bolivia, NW Argentina (Fig. 149) *M. grisea*
- 10' Synthorax with pale areas confined to narrow lines along thoracic sutures, dark metallic areas of synthorax extensive, covering most of mesepimeron and metepisternum (as in Fig. 99), paraproct 0.5 length of cercus or less, its tip armed with two or more small teeth of various sizes and shapes (Figs. 14, 25, 26, 28) . . . 11
- 11 (10') Cercus with anterior portion of superior ridge extending diagonally toward and often meeting medial portion of transverse ridge (Figs. 14, 26); genital ligula with distal margin transverse and with vestigial apical lobes (Figs. 131b, 134b) 12
- 11' Cercus with anterior portion of superior ridge isolated (Fig. 25) or meeting distal (outer) portion of transverse ridge (Figs. 19, 22); genital ligula with distal margin emarginate medially and lacking vestigial apical lobes (as in Figs. 44–46) 13
- 12 (11) Wings colored wine red at least to nodus and often beyond (Figs. 117a, 133); SE Brazil, NE Argentina (Fig. 150) *M. pudica*
- 12' Base of wings with dark brown extending to nodus (Figs. 113a, 132a) or hyaline (Fig. 113c); Chapada region of Mato Grosso and S Goiás State in Brazil (Fig. 150) *M. fuscibasis*
- 13 (11') Cercus with anterior portion of superior ridge isolated (Fig. 28) or with a conspicuous gap before distal (outer) portion of transverse ridge (Fig. 25a) 14
- 13' Cercus with anterior portion of superior ridge continuous along its entire length (Figs. 19, 22) 15
- 14 (13) Thorax brilliant metallic blue green; superior ridge anterior to transverse ridge of cercus isolated, forming a small mound with one or two blunt teeth (Fig. 28a, b); smaller species (HW 22–24 mm), wings hyaline with brown spot at HW tip (as in Fig. 118); Pará State in Brazil (Fig. 153) *M. smaragdina*
- 14' Thorax dull metallic gray green, often dusted with thin coating of white pruinosity, some males with brilliant white on medial part of mesepisternum (Fig. 103a); superior ridge anterior to transverse ridge of cercus isolated (Fig. 25a, Nova Teutonia) or with a conspicuous gap before distal (outer) portion of transverse ridge

- (Fig. 25a, Pelotas); larger species (HW 27–33 mm), base of wings hyaline or faintly to strongly milky white (Fig. 116); S Brazil, Paraguay, NE Argentina (Fig. 156) *M. pruinosa*
- 15 (13') Cercus with transverse ridge of distal fossa absent; medial lobe prominent bluntly triangular; paraproct capitate, armed with small teeth and lobes (Fig. 19a, b); Teresópolis region, Rio de Janeiro State in SE Brazil (Fig. 156) *M. hyalina*
- 15' Cercus with transverse ridge of distal fossa present; medial lobe broadly arcuate (Fig. 22a); paraproct not capitate, armed with the usual two or three small recurved teeth (Fig. 22a, d); Mato Grosso and Goiás states in SW Brazil (Fig. 157) *M. machadoi*

Key M-1

- Paraproct vestigial
- 1 Median lobe of cercus forming an acute point (Fig. 18); Amazonian regions of Ecuador and N Peru (Fig. 151) *M. hauxwelli*
- 1' Median lobe of cercus forming a gently rounded semicircle (Figs. 11, 13); Ecuador, Peru (Figs. 151, 156) 2
- 2 (1') Posterior third of cercus strongly arcuate medially (Fig. 13) *M. fulgida*
- 2' Posterior third of cercus only slightly arcuate medially (Fig. 11) *M. drepane*

Key M-2

- Dorsal surface of cercus with dense patch of stiff bristles
- 1 Cercus with broad, semicircular basal lobe much wider than remainder of cercus (Fig. 12); Ecuador, Peru (Fig. 155) *M. ephippium*
- 1' Cercus with basal lobe, if present, not wider than remainder of cercus (e.g., Figs. 9, 10, 21, 23) 2
- 2 (1') Basal lobe in mediodorsal view present but vestigial, protruding posteriorly and partially overlying base of median lobe (Fig. 23); E Peru (only holotype known) *M. marginata*
- 2' Basal lobe absent (Fig. 9), or represented by a slight convexity (Fig. 21) 3
- 3 (2') Paraproct 0.50 or more of length of cercus, its tip acuminate (Figs. 9, 10); body brilliant metallic red 4
- 3' Paraproct 0.45 or less of length of cercus, its tip blunt and armed with two to four small, recurved teeth (Figs. 7, 21); body dark metallic blue 5
- 4 (3) Median lobe of cercus prominent, forming an irregular semicircle; tip of paraproct strongly upcurved (Fig. 9); Venezuela, cen-

- tral and S Brazil, N Bolivia, SE Peru (Fig. 152) *M. cupraea*
- 4' Median lobe of cercus less prominent, forming a uniform semicircle; tip of paraproct gradually narrowing to a gently upcurved tip (Fig. 10); Ecuador, Peru, central Bolivia (Fig. 152) *M. devillei*
- 5 (3') Medial lobe of cercus triangular; distal 0.5 of cercus robust, as wide as basal 0.5; middorsal carina of abdominal segment 10 terminating in a prominent spine surpassing margin of segment (Fig. 21); Río Solimões region in Brazil, Madre de Dios Dept. in Peru (Fig. 155) *M. loutoni*
- 5' Medial lobe of cercus weakly convex and barely differentiated from remainder of mesal margin; distal 0.5 of cercus narrower than basal 0.5 (Fig. 7); middorsal carina of abdominal segment 10 with no spine, sometimes with a raised keel; Amazonian region in Brazil, S Venezuela (Fig. 153) *M. astrape*

KEY TO FEMALES OF MNESARETE

Caution should be exercised when identifying specimens beyond couplet 4. I have been unable to find reliable morphological characters that will allow distinction of *Mnesarete smaragdina* and *M. williamsoni*. Females of some species are unknown (*M. marginata*, and *M. rhopalon*) or are not recognizable (*M. drepane*, *M. fulgida*, and *M. machadoi*) among co-occurring unidentified females I have examined. Further aids in identification, if known, are enumerated under each species.

- 1 Thorax largely dull gray with narrow dull metallic stripe confined to mesal 0.5 of mesepisternum, posterior 0.5 or less of mesepimeron, and often with an isolated elongate spot at anterior end of metepisternum below wing base (Fig. 101b); abdominal dorsum dark, sides pale; intersternite largely pale, with a well-developed anterior shoulder forming an approximate right angle to posterior lobe (Fig. 87); Bolivia, N Argentina (Fig. 149) *M. grisea*
- 1' Thorax largely dark metallic green, purple, or copper; pale areas confined to narrow lines along sutures (e.g., Fig. 103b), or these pale areas narrower than metallic areas separating them (Fig. 100); intersternite dark, often black in mature females (pale in *M. pruinosa*; Fig. 95), shape variable 2
- 2 (1') Pterostigma present [note: occasionally this structure may be vestigial but there is usually an indication of a pterostigma in one or more wings]; species from SE Brazil, Paraguay, Misiones Prov. in Argentina 3
- 2' Pterostigma absent 4
- 3 (2) Prothoracic horn absent; metallic areas of thorax dark green; large species (HW 32–34

- mm); intersternite as in Fig. 80; SE Brazil (Fig. 159) *M. borchgravii*
- 3' Prothoracic horn present (as in Fig. 73) (small in one specimen from Argentina); metallic areas of thorax dark green dusted with white pruinosity in mature individuals, smaller species (HW 25–30 mm); São Paulo State in Brazil, Paraguay, Misiones Prov. in Argentina (Fig. 157) *M. lencionii*
- 4 (2') Wings relatively broad, ratio of greatest HW width to length 0.24 to 0.30; basal 0.3 (Figs. 113b, 132b) to entire (Fig. 117c) wing slightly to dark amber, color differing in intensity within the wing, usually darker toward base; narrow pale humeral stripe offset, upper part occupying approximately medial 0.3 along suture of mesepimeron and lower part occupying lower 0.3 along suture of mesepisternum (Fig. 100) or becoming absent in old mature females; Mato Grosso and SE Brazil; S Paraguay, NE Argentina 5
- 4' Wings relatively narrow, ratio of greatest HW width to length 0.23 or less; wings entirely hyaline or entirely light amber (as in Fig. 115); narrow pale humeral stripe of mesepimeron not abruptly abbreviated below or disjunct, often absent or in the form of a narrow thin line gradually widening anteriorly (as in Fig. 103b); Venezuela, Amazonian regions of Ecuador, Peru, Brazil south through S Brazil, Paraguay, N Argentina 6
- 5 (4) Wings relatively broad, ratio of greatest HW width to length 0.29 to 0.30 (Fig. 117c); Mato Grosso State and SE Brazil, S Paraguay, NE Argentina (Fig. 150) *M. pudica*
- 5' Wings relatively narrow, ratio of greatest HW width to length 0.24 to 0.26 (Fig. 113b); Mato Grosso and Goiás states in Brazil (Fig. 150) *M. fuscibasis*
- 6 (4') Dark thoracic coloration brilliant metallic green; some old specimens with a dusting of white pruinosity so that body appears largely gray Key F-1
- 6' Dark thoracic coloration cupreous or cupreous purple; some old specimens with varying amounts of white pruinosity on venter and met sternum Key F-2

Key F-1

- Dark thoracic coloration metallic green
- 1 Prothoracic horn present, often enlarged and easily visible (Fig. 73); intersternite largely pale (Figs. 90b, 95); venter of metathorax entirely pale, or with dark spots confined to medial part of venter; S Brazil, Paraguay, N Argentina (Fig. 156) *M. hyalina*, *M. pruinosa*
- 1' Prothoracic horn absent, or if present, small

- and barely visible; intersternite dark, venter of metathorax entirely dark, or with full complement of medial and lateral dark markings bordering metepimeron [note: juvenile females of *M. guttifera* may have a largely pale thoracic venter, see discussion under that species] 2
- 2 (1') Larger species (HW 25–30 mm); venter of thorax entirely black in mature specimens; from approximately 13°S (Mato Grosso, Goiás, and Bahia states south through S Brazil and Paraguay) (Fig. 158) *M. guttifera*
- 2' Smaller species (HW 23–25 mm); venter of thorax with black on medial and lateral margins of metasternum; from Amazonian region of Brazil (approximately 10°S) north to Venezuela 3
- 3 (2') Postclypeus dark metallic blue, contrasting with dark metallic green of epicranium; intersternite linear with anterior shoulder obsolete or poorly developed (Fig. 79); tip of abdominal segment 10 armed with small middorsal and dorsolateral spine on each side (Fig. 106); cercus long, as long as abdominal segment 10, tip slender, strongly acuminate (Fig. 106); wings hyaline; Amazonian region of Brazil, S Venezuela (Fig. 153) *M. astrape*
- 3' Postclypeus metallic green, same color as metallic green of epicranium; intersternite with well-developed anterior shoulder (Figs. 97, 98); tip of abdominal segment 10 armed with only middorsal spine (Figs. 107, 108); cercus short, shorter abdominal segment 10, tip less acuminate (Figs. 107, 108); wings slightly flavescent; Amazonian region of Brazil (Figs. 153, 154) *M. smaragdina*, *M. williamsoni* (see discussion under *M. smaragdina*)

Key F-2

Dark thoracic coloration cupreous or metallic purple

Caution should be used in identifying females past couplet 3; character differences are subtle and some females have been determined by supposition. Be sure to compare unidentified material with diagnoses and comments under species accounts.

- 1 Posterior margin of HW at vicinity of CuA slightly sinuous, gently bent caudad (Fig. 115b, c); postclypeus dark metallic blue, especially on apical 0.5; Río Solimões region in Brazil, Madre de Dios Dept. in Peru (Fig. 155) *M. loutoni*
- 1' Posterior margin of HW at vicinity of CuA not sinuous, linear; postclypeus dark to brilliant metallic copper, especially on apical 0.5 2
- 2 (1') Smaller species (HW 23–25 mm); prothoracic horn present (Fig. 67), hind lobe of

- prothorax evenly rounded (Fig. 56); pale propleural spot absent (Fig. 48); SE Peru, Pará south through Rondônia states in Brazil, N Bolivia (Fig. 152) *M. aenea*
- 2' Larger species (HW 25–29 mm); prothoracic horn absent or represented by a small bump (e.g., Fig. 71), hind lobe of prothorax slightly bilobed (Fig. 61), transverse medially (Fig. 57) and/or armed with an obtusely pointed lobe on lateral margin (Fig. 62); pale propleural spot usually present (as in Fig. 49) (except in *M. drepane* and probably also in *M. fulgida*) 3
- 3 (2') Intersternite bilobed, anterior and posterior lobes subequal or posterior lobe slightly longer than anterior lobe (Fig. 89); lateral margin of hind lobe of prothorax in anterolateral and lateral view forming a broad lobe meeting pleural margin at approximately 90° (Figs. 54, 71); these lobes prominent in dorsal view (Fig. 61); Amazonian regions of Ecuador and N Peru (Fig. 151) *M. hauxwelli*
- 3' Intersternite with anterior lobe small but present, about 0.25 as high as posterior lobe, posterior lobe linear (Figs. 81, 82, 85, 94); lateral margin of hind lobe of prothorax in anterolateral view lacking a broad lobe (Fig. 52) or with a lobe meeting pleural margin at considerably more than 90° (Figs. 50, 51 55), these lobes not prominent in dorsal view (Figs. 57, 58, 62) 4
- 4 (3') Lateral margin of hind lobe of prothorax in lateral view flexed anteriorly exposing posterior surface of hind lobe (Fig. 53); Ecuador, Peru (Fig. 155) *M. ephippium*
- 4' Lateral margin of hind lobe of prothorax in lateral view not flexed anteriorly thus not exposing posterior surface of hind lobe (Figs. 50–52, 55) 5
- 5 (4') Lateral margin of hind lobe of prothorax in anterolateral view usually with a small angulate process (Figs. 55, 62b, c), prothoracic horn represented by a small hump (Fig. 72); Ecuador, S Colombia, S Venezuela (Fig. 155) *M. metallica*
- 5' Lateral margin of hind lobe of prothorax in anterolateral view lacking a small angulate process, usually broadly rounded (Figs. 50, 51) or with no lobe (Fig. 52), prothoracic horn absent (Fig. 68) or represented by a small hump (Fig. 69) 6
- 6 (5') Hind lobe of prothorax in dorsal view entire, not bilobed or only slightly so (Fig. 57); intersternite with anterior lobe small but well developed, about 0.25 as high as posterior lobe, cleft between lobes U- or V-shaped, acute (Fig. 81); broad lobe of lateral margin of hind lobe of prothorax in anterolateral view meeting pleural margin at approximately 120° (Fig. 50); widespread in Amazonian region from W Peru to Mato

- Grosso region in Brazil, N Bolivia (Fig. 152)
..... *M. cupraea*
- 6' Hind lobe of prothorax in dorsal view bilobed (Figs. 58, 59); intersternite with anterior lobe absent, vestigial, or forming a low shoulder, cleft obtuse (Figs. 82, 83); lobe of lateral margin of hind lobe of prothorax in anterolateral view small or vestigial (Fig. 52) or moderately developed (Fig. 51); S Colombia, Ecuador, extreme SE Peru, central Bolivia 7
- 7 (6') Hind lobe of prothorax in anterolateral view with a moderately developed lobe on lateral margin (Fig. 51); prothoracic spot usually present (as in Fig. 49); central Ecuador, Peru, Bolivia (Fig. 152)
..... *M. devillei*
- 7' Hind lobe of prothorax in anterolateral view smoothly curved, with no moderately developed lobe on lateral margin (Fig. 52); prothoracic spot usually absent (as in Fig. 48); NE Ecuador, NE Peru, S Colombia (Fig. 151) *M. drepane* (?and *M. fulgida*)

Mnesarete aenea (Selys)

Figs. 6 (app), 48, 56, 67 (pth), 78 (int), 152 (mp)

Lais aenea Selys, 1853:28 (description of 1♂ and 1♀ from “Para”)

Mnesarete aenea: Davies and Tobin, 1984:12

DIAGNOSIS. Males of this widespread species are identifiable by the unique shape of the cercus (Fig. 6). *Mnesarete aenea* is the smallest member of the metallic red group (HW 22–24 versus 26–29 mm for other species), and the cercus lacks the patch of stiff bristles (Fig. 6) present in *M. cupraea* (Fig. 9) and *M. devillei* (Fig. 10). The presence of a well-developed paraproct separates this species from *M. drepane* (Fig. 11), *M. fulgida* (Fig. 13), and *M. hauxwelli* (Fig. 18).

The brilliant metallic female of *M. aenea* resembles those of *M. loutoni*, *M. devillei*, *M. cupraea*, *M. drepane*, and *M. fulgida*, but the small size of *M. aenea* (HW 23–25 mm) and largely allopatric distribution (Fig. 152) with all but *M. cupraea* will usually separate it from its larger congeners (HW 25–29 mm). Other characters are given in the key to females.

TYPES. I examined a syntype male (Fig. 6) labeled “Para/1850” in HC. Selys (1853) provides a range of measurements for the HW in his original description and states “*Patrie*: Para (Collection Dale, Selys, etc.)”; and again (Selys, 1854): “*Patrie*. Le *Para*, d’après deux males et deux femelles envoyés par M. Bates à M. Stevens, et d’après d’autres exemplaires de même provenance reçus par MM. Saunders et Dale.” I have been unable to trace any other specimens. In order to clarify application of the name, I designate the syntype male mentioned above as LECTOTYPE.

DISTRIBUTION (Fig. 152). Widely distributed in the Amazon region of Brazil west to Belém

(1°27’S) and south to N Bolivia (Cachuela Esperanza, 10°32’S 65°38’W, J.H. Williamson and J.W. Strohm, 10–11 Apr. 1922). Elevational data range from near sea level (Brazil, Pará State, Boa Vista, Río Xingu, FNS) to 300 m (Peru, Madre De Dios Dept., Explorer’s Inn on Río Tambopata east bank 30 km SW of Puerto Maldonado, DRP).

REMARKS. Of nine females I examined, all have a well-developed prothoracic horn, as illustrated in Fig. 67. One female (Brazil, Porto Velho, 28 Feb. 1922) has a poorly developed process, although three others from the same series possesses fully developed processes.

BIOLOGY. The following are penciled notes by J.H. Williamson from specimens he collected in Porto Velho in 1922: “Lights on top of leaves much like *Hetaerina*. Seen only during brief period of sunshine over creek in dense forest (1 Feb.),” “Creek in woods, 2 ½ mi N of town (22 Feb.),” and “This species from wooded part of Igarapé (1 Aug.).” Dennis Paulson collected *M. aenea* in Peru (personal communication 28 Nov. 2002) and noted: “At Explorer’s Inn, males were common on tiny sand-bottomed forest streams, where they perched 1–3 m above water on overhanging leaves and twigs. [They were m]ore common during sunny than cloudy periods but [they] just as often perched in dense shade as sun flecks. At Tambopata Research Center, farther up Río Tambopata (higher elevation), males of both *aenea* and *cupraea* were present in small numbers on a gravelly and sandy stream through forest, 2–4 m wide and <1 m deep, on completely cloudy days.”

OTHER MATERIAL EXAMINED. BRAZIL: Pará State, Belem, 1°27’S 48°29’W, 2 Aug. 1922, (J.H. Williamson & J.W. Strohm), 2♂ (RWG); same data but 7 Aug. 1922, 2♂ (IRSNB); stream at Caverna do Tatajuba, ca. 22 km SE Altamira, 100 meters, 3°15’S 52°15’W, 6 Oct. 1986, (P. Spangler & O. Flint), 3♂ (RWG); vicinity of Juriti Velho, 2°26’S 56°17’W, 30 Aug. 1995, 13♂, 2♀ (RWG); same data but 31 Aug. 1995, 9♂, 2♀ (RWG, LACM, USNM); same data but 1 Sep. 1995, 2♀ (RWG); Rondônia State, Porto Velho, 100 meters, 8°45’S 63°54’W, 1 Feb. 1922, (J.H. Williamson & J.W. Strohm), 1♂ (UMMZ); same data but 17 Feb. 1922, 2♂ (UMMZ); same data but 21 Feb. 1922, 1♂, 1♀ (UMMZ); same data but 22 Apr. 1922, 1♂ (UMMZ); same data but 27 Apr. 1922, 1♂ (USNM); same data but 5 May 1922, 1♂, 1♀ (UMMZ); Amazonas State, Hyatanahan, Río Purus, ca. 4°0’S 61°30’W, 22 Apr., (S.M. Klages), 1♀ (FSCA); BOLIVIA: El Beni, Río Beni, Cachuela Esperanza, 122 meters, 10°32’S 65°38’W, 10 Apr. 1922, (J.H. Williamson & J.W. Strohm), 1♂, 1♀ (RWG); same data but 11 Apr. 1922, 1♂ (RWG).

Mnesarete astrape De Marmels
Figs. 7 (app), 79 (int), 106 (ab), 153 (mp)

Mnesarete astrape De Marmels, 1989:13, figs. 1–6 (description of 2♂, 1♀ from Río Baría, Venezuela)

DIAGNOSIS. Male small, only species in which males have combination of metallic green coloration and a patch of dense, stiff bristles at the basal 0.30 of the cercus (Fig. 7). The morphology of the cercus approximates that of two other metallic green species, *Mnesarete smaragdina* (Fig. 28) and *M. williamsoni* (Fig. 29), but both lack the patch of bristles. Besides, the distal fossa in *M. astrape* occupies the distal 0.30 or more of the cercus, compared with only 0.25 or less in *M. smaragdina* and *M. williamsoni*. The paraproct is angulated in lateral view in *M. williamsoni* (Fig. 29d) and terminates in a narrow, truncate, spatulate tip; in *M. astrape* and *M. smaragdina* the tip of the paraproct is linear (Figs. 7c, 28c) and bluntly rounded. In *M. astrape*, the tip of the paraproct bears one small preapical and two apical recurved spines compared to only two apical rounded spines in *M. smaragdina*.

Females of *M. astrape* are small and metallic green and are most similar to *M. smaragdina* and *M. williamsoni*, but they can be differentiated by the following contrasting characters (characters for *M. smaragdina* and *M. williamsoni* in parentheses). In *M. astrape* the postclypeus is dark metallic blue (metallic green), the anterior shoulder of intersternite is obsolete or poorly developed (Fig. 79) (anterior lobe forming a well-developed shoulder; Figs. 97, 98), tip of abdominal segment 10 is armed with one middorsal and one small dorsolateral spines on each side (Fig. 106) (only middorsal spine; Figs. 107, 108), and the wings are hyaline (wings flavescent).

TYPES. I examined and illustrate a paratype male (Fig. 7) and allotype female (Figs. 79a, 106) in MIZA (De Marmels, 1989).

DISTRIBUTION (Fig. 153). *Mnesarete astrape* is a lowland Amazonian species thus far known from Venezuela (Río Baría in Amazonas State, 0°49'N 66°09'W) south through Óbidos (1°52'S 55°30'W) and east to Manaus (3°06'S 60°00'W), and ranges from about sea level (Manaus, Óbidos) to 150 meters (Río Baría).

REMARKS. A male from Óbidos, Pará State, Brazil, sent to me by Dr. A.B.M. Machado differs from the holotype (not examined) and paratype (examined) in possessing a hyaline HW tip. The cerci of the paratype and Óbidos males are similar (Fig. 7), although the basal lobe of the Óbidos male is slightly larger. Males from Manaus (Fig. 7) differ from the paratype and Óbidos male in that the basal lobe of the cercus is reduced, the dorsal surface of the basal 0.3 of the cercus is more planar and, when viewed laterally, the middle 0.3 of the cercus is strongly recessed. The paratype male seems intermediate in these characters between the Manaus and Óbidos examples. The distance between the cerci in the Óbidos male is slightly less than the width of each cercus, while the distance between the cerci in the Manaus males is as long as the width of cercus at base. At first, when I had only the Manaus and Óbidos males, I thought that they

represented two closely related species. However, examination of the paratype convinces me that the differences probably represent geographic variability.

BIOLOGY. Nothing recorded.

MATERIAL EXAMINED. VENEZUELA: Amazonas State, Alto Río Baría (Neblina Base Camp), 140 meters, 0°49'50"N 66°9'40"W, 24 June–11 July 1984, (J. De Marmels), 1♂, 1♀ [paratypes] (MIZA); BRAZIL: Amazonas State, Manaus, 3°6'S 60°0'W, no date, 1♂ (RWG); same data but 9 June 1922, (J.H. Williamson, J.W. Strohm), 1♂ (UMMZ), same data but 12 June 1922, 1♂, 1♀ (UMMZ); same data but 26 June 1922, 3♀ (RWG, UMMZ); Reserva Campinas, 60 km N of Manaus, 3°9'S 60°0'W, 6 Feb. 1979, (Oliver S. Flint, Jr.), 2♀ (RWG, USNM); Pará State, Óbidos, 81 meters, 1°54'30"S 55°31'8"W, Oct. 1953, (B. Ferreira), 1♂ (RWG); same data but no date, 1♂ (RWG).

Mnesarete borchgravii (Selys) new combination

Figs. 8 (app), 80 (int), 111 (wi), 130 (by),
159 (mp)

Hetaerina borchgravii Selys, 1869:658–659 [14–15 separate] (description of “plusieurs couples” from “Les environs de Tijuca, près de Rio-Janeiro”)

DIAGNOSIS. Males are easily distinguished from all other congeners by their large size (HW 33–40 mm, Abd 49–52 mm, compared to HW 20–31 mm, Abd 30–44 mm in other members of this genus), dark metallic green coloration, presence of pterostigmata, brown subapical HW spot (Fig. 111), and robust cercus (Fig. 8). The cercus in *M. borchgravii* is similar to that of the syntopic *Hetaerina brightwelli* (Kirby) (Fig. 137) but the medial lobe is smaller and less expanded.

Females are distinguished also by large size (HW 33–36 mm, Abd 40–42 mm) and presence of preostigmata except for females of *Hetaerina brightwelli*. These two species can be distinguished by the shape of the intersternite: broadly and subequally bilobed in *H. brightwelli* (Fig. 137), narrow with shorter anterior lobe deflexed and posterior lobe longer than anterior lobe in *M. borchgravii* (Fig. 138).

TYPES. Described from at least 11 males and two females from “Les environs de Tijuca, près de Rio-Janeiro, où plusieurs couples ont été recueillis par M. le comte Paul de Borchgrave d'Altena, ministre de Belgique au Brésil, qui a bien voulu me les offrir avec beaucoup d'autres Odonates rares, à son retour en Europe.” I examined two syntypes in the MCZ; other specimens, according to notes from the late B.E. Montgomery who examined them, are in the IRSNB.

DISTRIBUTION (Fig. 159). *Mnesarete borchgravii* is confined to SE Brazil, ranging from Rio de Janeiro State (Cachoeira de Macacu, 22°34'S 42°39'W) south through Santa Catarina State (Blu-

menau, 26°56'S 49°3'W) at elevations from 873 meters (São Bento do Sul) to 123 meters (Joinville).

REMARKS. Selys (1869) originally placed this species in *Hetaerina* remarking that it "is entirely different from other *Hetaerina* by the pterostigmata, by the absence of red spots in the wings." He further remarked "*pudica* among *Lais* presents by its red wings an exception in an inverse sense of the sort that I find *Lais* not different enough from *Hetaerina* to conserve [it] to the rank of subgenus." Although the appendages of the male are similar to those of *H. brightwelli*, the lack of basal red spots (male) and shape of the intersternite (female) conform to characters shared by all other species in *Mnesarete* (except *M. pudica*). I believe a transfer of this species to *Mnesarete* is justified so as to allow for the genus to be more precisely defined (see key to genera).

BIOLOGY. Frederico Lencioni (*in litt.*) collected a male and two females on a trail in the middle of the forest, relatively far away from a river that flowed parallel to the trail. They perched approximately 2 m above the ground on the tips of leaves of a tree fern. Other species associated with *M. borchgravi* were *Leptagrion elongatum* Selys, *Leptagrion perlongum* Calvert, *Heteragrion consors* Hagen in Selys, and an undescribed species of *Heteragrion*.

MATERIAL EXAMINED. BRAZIL: Santa Catarina State, Blumenau, 150 meters, 26°56'S 49°3'W, 2♂ (RWG); Joinville, 123 meters, 26°18'S 48°50'W, 3 Mar. 1989, 3♂ (RWG); same data but 12 Mar. 1987, 1♂ (RWG); same data but 16 Mar. 1989, 2♀ (RWG); same data but 13 Dec. 1981, (Miers), 1♂ (RWG); same data but 23 Dec. 1981, (Miers), 1♀ (RWG); same data but 25 Dec. 1981, (Miers), 1♂ (RWG); São Bento do Sul, 873 meters, 26°15'S 49°23'W, 12 Feb. 1987, 1♂ (RWG); same data but 25 Feb. 1987, 1♂ (RWG); [no data], 26 Apr. 1958, (N.D. Santos), 1♂ (FSCA).

Mnesarete cupraea (Selys)

Figs. 9 (app), 49, 50, 57, 68 (pth), 81 (int),
152 (mp)

Lais cupraea Selys, 1853:28 (description of 1♂ from "Brésil")

Mnesarete scintilla Rácenis, 1968:167–170, figs. 14–16 (description of 1♂ from Canaima, Bolívar State, Venezuela)

Mnesarete cupraea: Davies and Tobin, 1984:12; De Marmels, 1990:341 (synonymy of *M. scintilla*)

DIAGNOSIS. The large medial lobe, presence of stiff bristles at base of cercus (Fig. 9), and cupreous coloration easily separate males of this species from all others. This species might be confused with *M. devillei* but can be separated by characters stated in couplet 4 of Key M-2.

Females possess a cupreous coloration similar to that found in *M. aenea*, *M. devillei*, *M. drepane*, *M. ephippium*, *M. fulgida*, and *M. loutoni*, and separation from these species requires care. The largely

allopatric distribution of *M. cupraea* from all of these species (except for *M. aenea* and *M. loutoni*) will allow for the determination of females (Fig. 152). The smaller size of *M. aenea* (HW 23–25 mm), shape of the hind lobe of the prothorax (Fig. 56), and presence of a prothoracic horn will distinguish this species from the largely sympatric *M. cupraea* (HW 25.5–28 mm). Females of *M. cupraea* can usually be distinguished from the following species as follows. The lateral margin of the hind lobe of the prothorax in *M. cupraea* is developed as a separate lobe (Figs. 50, 57) but is not as pronounced as in *M. hauxwelli* (Figs. 54, 61), nor forming an angulate process as in *M. metallica* (Figs. 55, 62b, c). The medial portion of the hind lobe when viewed dorsally is evenly convex or slightly bilobed (Fig. 57) in *M. cupraea*; in *M. hauxwelli* (Fig. 61), *M. ephippium* (Fig. 60), and *M. drepane* (Fig. 52) the medial portion of the hind lobe is bilobate.

TYPES. I illustrate the appendages of the holotype in the BMNH (Kimmings, 1969).

DISTRIBUTION (Fig. 152). *Mnesarete cupraea* has the widest distribution of the genus. It occurs throughout the Amazonian region of South America from northeastern Venezuela (De Marmels, 1990; Rácenis, 1968 [as *M. scintilla*]) and French Guiana (Geijskes, 1971; Papazian, 1999) east to Ceará State (Maranhão, Rio Maracaquare, ca. 80 km E of Caninde [Rio Gurupi], B. Malkin, 1 male) south through Mato Grosso State (Longfield, 1929) and west to Madre de Dios Department, Peru (Paulson, 1985). Like *M. aenea*, *M. cupraea* is a lowland species of humid forest streams ranging from near sea level (Brazil, Pará State, Boa Vista, Rio Xingu) to 690 meters (Brazil, Mato Grosso State, Melguerra, ca. 15 mi S of Diamantino).

REMARKS. Other males differ from the holotype by having the medial lobe less prominent. Despite this variability, males of this species are easily recognized by the unique shape of the caudal appendages. Selys (1869) included in his supplementary description of *L. cupraea* a "... young male from Peba, upper Amazon, by M. Hauxwell. (Coll. MacLachlan.)" as this species, but he later (1880) corrected this error by recognizing this specimen as *Lais fulgida*.

Fraser (1946), in an attempt to clarify conflicting descriptions of certain Selysian species in this genus, figured what he believed was a male of *M. cupraea* from Yumbatos, Peru, in the Leeds Museum with one of the cerci missing. Despite the contrasting differences shown by his fig. 5 for this specimen ("The superior appendages are here shown strongly rotated outwards in order to demonstrate their outlines: normally the apices look inwards and downwards") and fig. 4 for his correctly identified specimen of *M. devillei*, I strongly believe the specimen from Yumbatos to be a male of *M. devillei*. I have been unable to examine this specimen; it is not in the Leeds Museum (Mr. Adrian Norris, personal communication, 9 Oct. 2002), nor in the

Manchester Museum where much of Fraser's Amazonian Odonata went at the time of the Second World War (Colin Johnson, personal communication, 28 Oct. 2002), nor in the BMNH (Steven Brooks, personal communication 10 Oct 2002).

Rácenis (1968) described *Mnesarete scintilla* from five males from Canaima, Bolívar State, Venezuela. His illustrations of the appendages do not differ significantly from specimens of *M. cupraea* I have examined. J. De Marmels (personal communication 28 Nov. 1986) confirmed my suspicion that *M. scintilla* was a junior synonym of *M. cupraea*, an opinion he later published (De Marmels, 1990). Steinmann (1997:44) in error places *M. scintilla* under synonymy with *M. saltuum* without explanation.

BIOLOGY. This species was common along with *Hetaerina auripennis* (Burmeister) and *H. laesa* Hagen in Selys on streams at Fazenda Rancho Grande, a farm 60 km S of Ariquemes (10°31'48"S, 62°48'0"W), in Rondônia State, Brazil. Males perched on the tips of leaves and snags at stream's edges always facing the stream. Dennis Paulson (personal communication 28 Nov. 2002) states that at "Explorer's Inn, SW Puerto Maldonado, males perched 1–3 m up along small sand-bottomed streams under canopy, as often in shade as sun; males had lengthy horizontal circling display flights not dissimilar from some *Hetaerina* interactions. Female *Mnesarete*, probably this species, [were] observed ovipositing in branch under water for 70 minutes (by one of my students). *Mnesarete aenea* slightly less common on same stream. At Tambopata Research Center, males of both *aenea* and *cupraea* were present in small numbers on a gravelly and sandy stream through forest, 2–4 m wide and <1 m deep, on completely cloudy days."

OTHER MATERIAL EXAMINED. GUYANA: Rupununi Dist., Moco River (Kanuku Mts.), ca. 30 km E Lethem, ca. 160 meters, 3°18'33"N 52°22'00"W, 3 Apr. 1994, (Oliver S. Flint, Jr.), 2♂ (USNM); Essequibo River, Rockstone, 11 Mar. 1969, (W.D. Duckworth & R.E. Dietz), 1♂ (USNM); FRENCH GUIANA: Ilet Massiriki, 2°58'N 52°22'W, 17 Nov. 1969, (Balachowsky-Gruner), 1♀ (RWG); VENEZUELA: Bolívar State, Cano Curususuk, 63 km S Río Cuyuní, 11–12 Feb. 1976, (C.M. & Oliver S. Flint, Jr.), 1♂ (USNM); BRAZIL: Ceara State, Maranhão, Rio Maracaguaré, ca. 80 km E of Caninde (Rio Gurupi), 4°21'S 39°19'W, 20 Feb. 1966, (B. Malkin), 1♂ (RWG); Pará State, Óbidos, 81 meters, 1°54'30"S 55°31'8"W, Sept. 1962, (Jose Braselivo), 1♂ (RWG); same data but 11 Nov. 1962, 1♂ (RWG); Jacareacanga, 88 meters, 6°16'S 57°39'W, Sept. 1969, (F.R. Barbosa), same data but Oct. 1969, 2♂ (RWG); same data but Nov. 1969, 1♂ (RWG); 1♂ (RWG); same data but Apr. 1970, 1♂ (RWG); same data but Apr. 1970, 1♂ (RWG); same data but June 1970, 1♂ (RWG); Amazonas State, São Paulo de Olivença, 71 meters, 3°27'S 68°48'W, Aug. 1966, 1♂ (RWG); Rondônia State, Vila Murtinho, 133

meters, 10°24'S 65°22'W, 28 Feb. 1922, (J.H. Williamson & J.W. Strohm), 1♂ (RWG); same data but 1 Apr. 1922, 2♂ (RWG); same data but 2 Apr. 1922, 1♂, 2♀ (RWG); same data but 4 Apr. 1922, 1♀ (RWG); Abuná 112 meters, 9°42'S 65°23'W, 8 Mar. 1922, (J.H. Williamson & J.W. Strohm), 1♂ (RWG); same data but 18 Mar. 1922, 2♂, 1♀ (RWG, UMMZ); Rio Pardo and tributaries, ca. 13 km NW of Fazenda Rancho Grande (62 km SW of Ariquemes), 165 meters, 10°25'48"S 62°51'36"W, 5–10 Nov. 1989, 11♂, 1♀ (RWG, LACM); Fazenda Rancho Grande, farm of Harald Schmitz and environs within about 15 km radius, 60 km S of Ariquemes, 165 meters, 10°31'48"S 62°48'0"W, 16–24 Mar. 1989, (S.W. Dunkle), 3♂ (RWG, USNM); same data but 17–24 Mar. 1989, (John Pasko), 2♂, 1♀ (RWG); same data but 17–24 Mar. 1989, (John Pasko), 2♂, 1♀ (RWG); same data but 2–11 Nov. 1989, (R.W. Garrison), 31♂, 6♀ (RWG, LACM, USNM); same data but 19–29 Sept. 1996, (Tony Taraszka), 2♂, 1♀ (RWG); stream ca. 7 km SE of Cacaullandia, ca. 70 km S of Ariquemes, 165 meters, 10°31'48"S 62°48'0"W, 7 Nov. 1989, (R.W. Garrison), 6♂, 2♀ (RWG); Jaciparaná, 9°16'S 64°24'W, 8 Feb. 1961, (A.B.M. Machado), 1♂ (RWG); PERU: Madre De Dios Dept., Explorer's Inn on Río Tambopata, Tambopata Reserve, 30 km SW Puerto Maldonado, 100 meters, 12°50'S 69°17'W, 17 June 1977, (D.R. Pearson), 1♂ (RWG); BOLIVIA: El Beni, Río Beni, Cachuela Esperanza, 122 meters, 10°32'S 65°38'W, 12 Apr. 1922, (J.H. Williamson & J.W. Strohm), 1♂ (RWG).

Mnesarete devillei (Selys)

Figs. 10 (app), 51, 58, 69 (pth), 82 (int),
112 (wi), 152 (mp)

Laïs hauxwelli: Selys, 1879:365 (19 separate, description of 1♂ from "Pérou oriental" as *L. hauxwelli*)

Laïs devillei Selys, 1880:2 (description of 1♂ and 1♀ from "Pérou oriental? d'après un couple de la collection Mac-Lachlan que j'ai décrit aux 4^{es} additions, le confondant avec l'*Hauxwelli*.—Plusieurs exemplaires de Baïsa (Équateur), par M. De Ville ."); McLachlan, 1881:26 (correction of type locality ["It [*devillei*] was originally described from Baïsa (Ecuador); I have it also from the Rio Napo (not "Pérou oriental?" as indicated by de Selys)"]).

Mnesarete devillei: Fraser, 1946:30–31, fig. 4 (re-description of *M. devillei* (Selys))

Mnesarete cupraea: Fraser, 1946:31–32, fig. 5 (mis-identification)

Mnesarete devilli: Steinmann, 1997:42 (misspelling)

DIAGNOSIS. The gently curved scimitarlike cercus of *M. devillei* (Fig. 11) is remarkably like that of *M. drepane* (Fig. 11), but the long, needlelike paraproct contrasts with the rudimentary condition found in *M. drepane*. No other metallic red species

possesses a long paraproct terminating in an acuminate point. The cerci are also similar to those of the poorly known *M. fulgida* (Fig. 13), but in this species the cercus is more strongly curved.

Females of *M. devillei* from Pakitzta, Peru (where only this species and the easily distinguishable *M. loutoni* are known to occur), are almost inseparable from females of *M. drepane* collected with a long series of males from Limoncocha, Ecuador. Their similarity is not surprising, given the similarity of the male cerci discussed above. Despite an examination of the anterior and middle lobes of the pronotum, I have not been able to find any significant modifications in morphology to accommodate the different shapes of the paraprocts between these two species. I detected only a slight difference in the modification of the lateral margin of the hind lobe of the pronotum (Figs. 58, 59) as mentioned in the key. The difference is largely one of degree, and I acknowledge that some females will probably not be identifiable. The largely allopatric or parapatric distribution of these two taxa may help distinguish them, but further collecting will probably show their distributions to overlap. I have been unable to recognize bona fide females of *M. fulgida*, even though I have seen females collected in company with males. I am assuming that they will also be similar to *M. drepane* and hence, to *M. devillei*.

Mnesarete devillei has been collected with *M. metallica* in the Río Napo watershed region in the eastern cordillera of southeastern Napo Prov. in central Ecuador (Fig. 152). Despite differences in appendage morphology between males, females are similar. The lateral margin of the hind lobe of prothorax in *M. metallica* usually possesses an angular process (Fig. 72) and the medial part of the middle lobe in dorsal view is not bilobate (Fig. 62). In *M. devillei*, the lateral margin of the hind lobe of the prothorax forms a convex lobe differing in appearance from the remainder of the lateral margin (Fig. 69), and the medial region of the hind lobe is slightly bilobate (Fig. 58).

TYPES. I illustrate the appendages of the lectotype ("E. Peru?") in the BMNH (Kimmins, 1969).

DISTRIBUTION (Fig. 152). *Mnesarete devillei* is thus far known from the humid foothills along the eastern cordillera in Ecuador (1°1'S 77°50'W) through Peru and Bolivia (17°37'S 63°46'W). I have seen no records from the lowland Amazon Basin. Altitudinal gradients range from about 119 meters (Shapajilla, Peru) to 1700 meters (Santa Isabel, Cosñipata Valley, Paucartambo Prov., Peru). Its distribution overlaps with *M. ephippium* and *M. hauxwelli*, and it has been taken together with *M. metallica*.

REMARKS. Recognition of this species was initially hampered by Selys (1879), who included a male of this species in a supplementary description of *Lais hauxwelli*. Fraser (1946) correctly associated specimens in the Leeds Museum and presented first illustrations of the appendages. However, as explained under *M. cupraea*, I believe he incorrectly

identified (and illustrated) a single male of *M. devillei* from Yumbatos, Peru, in the Leeds Museum as *M. cupraea*.

BIOLOGY. Jerrell J. Daigle collected this species in July 1996 at the Río Sinde (Ecuador: Napo Prov., Río Sinde, 5.3 km E of Puerto Napo, Jatun Sacha Road) and provided these notes (abstracted): "Not wary; often found together (with *M. metallica*) in mixed shade on side sloughs and tributaries of bigger streams and small rivers at higher (330–500 meters) elevations. Streams about 3–5 m feet wide with depths about 30–50 cm, moderately rocky, gravel bottomed with some sand and mud with occasional bedrock. Usually in lower foothills of Andes. Found with *Hetaerina sanguinea* Selys, *Argia adamsi* Calvert, and *Progomphus pygmaeus* Selys."

OTHER MATERIAL EXAMINED. ECUADOR: Napo Prov., Jatun Yacu, Río Napo watershed, eastern Ecuador, 700 meters, 1°1'S 77°50'W, Mar. 1937, (William Clarke-Macintyre), 5♂ (RWG); Napo, 522 meters, 1°3'S 77°47'W, 15 Mar. 1934, (William Clarke-Macintyre), 1♀ (RWG); 2nd stream E of Río Sinde, E of Puerto Napo on Jatun Sacha Road, Permit 029-1C INEFAN/DANVS/VS, 522 meters, ca. 1°3'S 77°47'W, 23 July 1996, (S.W. Dunkle), 2♂ (RWG); Puerto Napo, 11.2 km E of hwy 45 on Jatun Sacha Road, Río Tiyuyacu, 522 meters, ca. 1°3'S 77°47'W, 23 July 1996, (Bill Mauffray), 1♂ (RWG); Río Sinde, 500 meters, 1°2'54"S 77°44'48"W, 12 Nov. 1997, (T.W. Donnelly), 1♂ (TWD); Arayuno, 467 meters, 1°14'S 77°40'W, Sept. 1979, 1♂ (RWG); Sarayacu, 700 meters, 1°40'S 77°35'W, 2♂ (RWG); Cotos, plantation on Río Napo, below Napo, 429 meters, 2°2'S 77°30'W, 28 May 1934, (William Clarke-Macintyre), 1♀ (RWG); Napo Prov., Yahahurco, 650 meters, July 1978, 1♂ (RWG); PERU: Loreto Dept., Shapajilla, 119 meters, 4°41'S 74°17'W, 11 July 1938, (Felix Woytkowski), 1♂ (RWG); same data but 12 July 1938, 1♂ (RWG); same data but 25 July 1938, 1♀ (RWG); same data but 14 May 1939, 1♀ (RWG); same data but 27 May 1939, 1♀ (RWG); Boquerón del Padre Abad, NE of Tingo María, 440 meters, 8°58'S 75°50'W, 8 Aug. 1946, (Felix Woytkowski), 1♂ (RWG); same data but 10 Aug. 1946, 1♀ (RWG); same data but 12 Aug. 1946, 1♂ (RWG); same data but 18 Aug. 1946, 1♂ (RWG); same data but 20 Aug. 1946, 1♀ (RWG); Agwaitia, 170 meters, 9°1'S 75°31'W, 7 Sept. 1946, (Felix Woytkowski), 1♂ (RWG); same data but 11 Sept. 1946, 1♂ (RWG); Huánuco Dept., vicinity of Tingo Maria, 9°8'S 75°74'W, 30 July 1937, (Felix Woytkowski), 1♂ (RWG); Junín Dept., Vicinity of Sani Beni, 840 meters, 11°14'S 74°37'W, 2 Aug. 1935, (Felix Woytkowski), 1♂ (RWG); same data but 10 Aug. 1935, 1♂, 1♀ (RWG); same data but 11 Aug. 1935, 1♀ (RWG); same data but 22 Aug. 1935, 1♀ (RWG); same data but 25 Aug. 1935, 1♂ (RWG); same data but 30 Aug. 1935, 1♂ (RWG); same data but 11 Sept. 1935, 1♂ (RWG); same data but 15 Sept. 1935, 1♂ (RWG); same data but 17 Sept. 1935, 1♂

(RWG); same data but 25 Sept. 1935, 1♂ (RWG); same data but 28 Sept. 1935, 2♂ (RWG); same data but 21 Sept.–11 Nov. 1935, 2♂ (RWG); Sapiro, 714 meters, 11°16'S 74°41'W, 24 May 1940, (Pedro Paprzycki), 1♂ (RWG); same data but 25 May 1940, 1♀ (RWG); same data but 29 May 1940, 4♂ (RWG); same data but 30 May 1940, 1♀ (RWG); same data but 5 June 1940, 2♂ (RWG); same data but 6 June 1940, 1♂ (RWG); same data but 8 June 1940, 1♀ (RWG); same data but 12 June 1940, 2♀ (RWG); same data but 4–5 June 1940, 8♂ (RWG); same data but June 1940, 6♂ (RWG); same data but 19 July 1940, 1♂ (RWG); same data but 4 Aug. 1940, 1♂ (RWG); same data but 2 Sept. 1940, 1♂ (RWG); same data but 3 Nov. 1940, 3♂ (RWG); same data but 6 Nov. 1940, 1♂ (RWG); same data but 8 Nov. 1940, 2♂ (RWG); same data but 13 Nov. 1940, 1♂ (RWG); same data but 14 Nov. 1940, 1♂ (RWG); same data but 16 Nov. 1940, 1♂ (RWG); same data but 20 Nov. 1940, 2♂ (RWG); same data but 26 Nov. 1940, 1♂ (RWG); same data but 27 Nov. 1940, 2♂ (RWG); same data but 7–20 Nov. 1940, 7♂ (RWG); same data but 20 Dec. 1940, 1♀ (RWG); same data but 3 Jan. 1941, 1♀ (RWG); same data but 6 Jan. 1941, 1♂ (RWG); same data but 12 [no month] 1941, 1♀ (RWG); Cuzco Dept., Camisea River drainage; San Martín "C" (Shell Oil gas exploration site), 431 meters, 11°46'53"S 72°42'6"W, 2 Mar. 1997, (J. Louton), 2♂ (RWG, USNM); Santa Isabel, Cosñipata R. Valley, 1700 meters, 13°1'S 71°17'W, 2 Jan. 1952, (Felix Woytkowski), 1♂ (RWG); Madre de Dios Dept., Hotel Amazonas, across from Atalaya on small stream, 414 meters, 12°52'13"S 71°22'34"W, 27–28 June 1993, (R.W. Garrison), 2♂ (RWG); Parque Nacional Manu, Quebrada Fortaleza, approx. 5 km E Pakitza base camp, 20 Oct. 1987, (Jerry A. Louton), 1♂ (RWG); approx. 500 meters E Pakitza, quebrada at Twin Giants, Trocha del Rio, 250 meters, 11°55'48"S 71°15'18"W, 14 Oct. 1987, (J.A. Louton), 1♂ (RWG); Pakitza, Reserved Zone, trail 1, 250 meters, 11°55'48"S 71°15'18"W, 9 Sept. 1988, (O.S. Flint, Jr.), 4♂ (RWG); same data but 12 Sept. 1988, 3♂ (RWG); same data but 21 Sept. 1988, 2♂ (RWG); same data but small quebrada nr. forest zone 1, 6 Oct. 1987, (J.A. Louton), 1♀ (RWG); same data but trail 2, 17 Sept. 1988, (O.S. Flint, Jr.), 1♂ (RWG); same data but stream 0.7 trail km E on Trocha 1, 19 Sept. 1988, (Jerry A. Louton, F. Chávez), 1♀ (RWG); same data but trail 2, 20 Sept. 1988, (O.S. Flint, Jr.), 1♂ (RWG); same data but T2 S19, 8 Sept. 1989, (Jerry A. Louton), 2♀ (RWG); same data but Playa Trail, stream, 9 Sept. 1989, (Nancy E. Adams), 1♂ (RWG); same data but Trail 1, marker 14 (1st stream), 9 Sept. 1989, (Nancy E. Adams), 4♂, 1♀ (RWG); same data but Trail 2, marker 18, seeps, 12 Sept. 1989, (Nancy E. Adams), 1♂ (RWG); same data but T2 base camp to S11–12, 12 Sept. 1989, (Jerry A. Louton), 2♂ (RWG); same data but kitchen stream, 13 Sept. 1989, (Nancy E. Adams), 1♂, 1♀ (RWG); same

data but Trail 2, marker 15 (1st stream), 16 Sept. 1989, (Nancy E. Adams), 2♂ (RWG); same data but T2 to R2 to T1, 18 Sept. 1989, (Jerry A. Louton), 1♂ (RWG); Trail 1, marker 14, (1st stream), 19 Sept. 1989, (Nancy E. Adams), 1♂ (RWG); BOLIVIA: Cochabamba Dept., forest stream E of Sajta (a small village that lies roughly halfway between Buena Vista and Villa Tunari), 202 meters, 17°10'S 64°21'W, 16 Nov. 1999, (K.J. Tennessen), 1♂ (KJT); stream N of Shinahota (about 25 km E of Villa Tunari), 265 meters, 17°1'12"S 65°8'24"W, 20 Nov. 1999, (K.J. Tennessen), 1♂ (KJT); stream, Parque Ecoturístico Machia, E of Villa Tunari, 265 meters, 16°55'S 65°22'W, 20 Nov. 1999, (K.J. Tennessen), 2♂ (KJT); stream N of Shinahota (about 25 km E of Villa Tunari), 385 meters, 17°26'60"S 63°37'60"W, 20 Apr. 1950, (L.E. Peña), 1♂ (UMMZ); Santa Cruz Dept., Amboro Parque Nacional, Matarucu, small stream, 12 Nov. 1998, (K.J. Tennessen), 1♂ (RWG); Parque Nacional Amboro, Mataracú, Serranía, 609 meters, 17°37'S 63°47'W, 12 Nov. 1998, (K.J. Tennessen), 3♂, 1♀ (KJT).

Mnesarete drepane new species

Figs. 11 (app), 52, 59 (pth), 83 (int), 151 (mp)

DESCRIPTION. Holotype Male. Head entirely matte black with cupreous reflections around vertex and postfrons; base of mandible, labium, labrum, gena, and clypeus black with cupreous reflections. Occipital tubercles present but small.

Prothorax entirely black with cupreous reflections; propleural spot a small longitudinal spot above anterior end of notopleural suture; synthorax dark cupreous with vestigial obscure narrow pale stripe along lower half of second and most of third lateral sutures, lower margin and venter of thorax matte black with obscure pale spots on mesinfra- and metinfraepisternum, below spiracle of metepisternum, and posteroventral margin of metepimeron; two small obscure spots on venter of thorax. Legs and armature black. Wings hyaline; venation black; pterostigma lacking; FW tip hyaline, a well-defined brown apical spot on HW; two rows of cells behind CuA in FW (except for one to three extra cells), two in HW; CuA descending posterodistally from tip of CuP and largely paralleling MP; this area enclosing mostly one row of cells at base.

Anx: FW: 26/29; HW: 26/29.

Abdomen cupreous, becoming darker on sides; posterior margin of segment 10 transverse, without middorsal spine. Apical segment of genital ligula lacking apical lobes, with distal margin ciliate and emarginate.

Abdominal appendages (Fig. 11) black. Cercus narrow, linear, slightly arcuate, with a tuft of thick, coarse hairs at mediobasal margin; medial lobe small, roundly triangular, extending medially to basal margin of cercus; distal fossa narrow, occupying distal 0.4 of cercus, largely hidden by superior ridge; in mediodorsal view transverse and su-

perior ridges meeting at approximately a rounded 90° angle; medial area between basal tuft of hairs and edge of distal fossa strongly concave; cercus in lateral view linear; paraproct vestigial, forming a small swollen tubercle.

HW 25 mm, abdomen 35 mm.

Allotype Female. Head as in male but with following areas pale: base of first antennal segment, small spot on base of labium, base of mandible, obscure spot on each side of labrum. Rear of head black, occipital tubercles as in male.

Prothorax as in male; propleural spot vestigial; prothoracic horn absent; hind lobe (Fig. 59) transverse, broadly emarginated medially, lateral margin undifferentiated (Fig. 52); intersternite (Fig. 83c) linear, with anterior margin slightly swollen; synthorax as in male, but with narrow, pale humeral stripe and corresponding obscure white spots at base of mesinfraepisternum and mesepimeron larger. Venter of thorax with two pairs of oblique pale spots, one pair near base of legs, the other at center. Coxae, legs, and armature black. Wings as for male, but with wing tips hyaline and with one row of cells (with two interpolated cells at base of left HW) between MP and CuA; two rows of cells between CuA and wing margin.

Anx: FW: 29/27; HW: 27/25.

Abdomen as in male, but with small obscure pale spot before annulus of segment 1; lateroventral margin of segment 2 with obscure pale streak interrupted by black at posterior 0.7–0.8 of segment, annulus black; segments 3–5 obscurely pale ventrolaterally, dorsum of segments 8 and 9 evenly convex without a trace of middorsal carina, tip of segment 10 with middorsal spine surpassing end of segment followed by a smaller supplementary spine dorsolateral to middorsal one; ventrolateral margin of segment with a cluster of three spines; cercus black.

HW 27 mm, abdomen 30 mm.

Paratypes. Measurements: male, HW 25–28.5 mm, abdomen 34–37.5 mm, anx FW 27–31, HW 24–28; female ($n = 7$), HW 25–27 mm, abdomen 29–30 mm, anx FW 23–25, HW 29–30.

ETYMOLOGY. *drepane*—Greek for sickle, in reference to the scimitarlike cerci.

DIAGNOSIS. Males of *M. drepane* (Fig. 11) have cerci most similar to those of *M. devillei* (Fig. 10), but the rudimentary condition of the paraprocts in *M. drepane* easily distinguishes these two species. *Mnesarete drepane* also resembles *M. fulgida* (Fig. 13), but the cercus in that species is more arcuate. A series of 74 males of *M. drepane* and 23 males of *M. fulgida* (including holotype) shows no intermediate condition as to cercal morphology, and I believe that specific status for *M. drepane* is assured. Both species have been collected together at two localities in Ecuador (Orellana Prov., La Selva Jungle Lodge, 100 km E Coca; Parque Nacional Yasuni, Biological Research Station and surrounding forest).

Although I have no positive proof that the fe-

males I am identifying as *M. drepane* are this species, I am reasonably confident that I have associated them correctly since they were collected with a long series of males from an area where no other similar species was present. Females are most easily confused with *M. devillei* and are diagnosed under that species.

DISTRIBUTION (Fig. 151). Thus far only known from the Lago Agrio region in Sucumbíos Dept. in NE Ecuador (0°6'N 76°52'W) southeast to the Explorama Lodge area, Loreto Dept., Peru (3°30'S 73°13'W). It occurs within the range of the following species: *M. ephippium*, *M. fulgida*, *M. bauxwelli*, and *M. metallica*, and northeast of the known distribution range of *M. devillei* (Figs. 151, 155).

REMARKS. Teneral males are more cupreous than older individuals. A faint, partial hairline may be present along part of the humeral suture, and HW tip markings are absent or barely more visible than in mature males. The type series is uniform in appendage morphology. The synthorax in some males is almost entirely cupreous, with only a partial obscure incomplete pale line along third lateral suture.

I have been unable to recognize females of *M. fulgida*, a species in which males are morphologically similar to those of *M. drepane*. *Mnesarete fulgida* seems uncommon in collections, and I have females that were collected with males of this species. However, I cannot be sure that they are really females of *M. fulgida*. Males and females of both species have been collected at or near the same locality in E Ecuador and NE Peru (Fig. 151), which suggests that the two species may occupy different types of habitats.

BIOLOGY. Jerrell J. Daigle collected this species in July 1996 at the Río Savaleta (Ecuador: Orellana Prov., Parque Nacional Yasuni, Río Savaleta, Yasuni Road Marker km 31.0) and provided the following comments: "Wary on wide 10–15 m shaded sandy but stable bottomed lowland floodplain rainforest streams with occasional open clearings caused by fallen giant trees. Adults perch facing stream high on foliage or tips of branches of fallen trees. Not seen with other species of *Mnesarete* but seen with *Heteragrion inca* Calvert and *Neoneura denticulata* Williamson."

HOLOTYPE. ♂, ECUADOR: Prov. Sucumbíos, Limoncocha on Río Napo, 0°24'S 76°37'W, 3 Nov. 1980 (Minter J. Westfall, Jr., & David G. Robinson), (FSCA).

ALLOTYPE. ♀, same data as holotype but 8 Nov. 1980 (Minter J. Westfall, Jr.).

PARATYPES. 81 ♂, 7 ♀, ECUADOR: Sucumbíos Prov., Limoncocha, forest stream, 16 Feb. 1972, (David L. Pearson), 1 ♂ (FSCA); same data as holotype but 1 Dec. 1973, (Boyce A. Drummond III); same data but 11 Feb. 1974, 1 ♂; Lago Agrio, 18 Apr. 1976 (Andrea Langley), 1 ♂ (USNM); Limoncocha, small stream, 243 meters, 11 July 1977, (Kenneth W. Knopf), 1 ♂ (RWG); Limoncocha, 22

Aug. 1980 (Sidney W. Dunkle), 3♂ (SWD); same data but 24 Aug. 1980, 8♂, 1♀ (SWD, RWG); same data but 28 Aug. 1980, 4♂ (SWD); same data as holotype but 3 Nov. 1980, 2♂; same data as holotype but 5 Nov. 1980, 5♂, 1♀; same data as holotype but 7 Nov. 1980, (M.J. Westfall, Jr.), 10♂, 1♀; same data as holotype but 10 Nov. 1980, (M.J. Westfall, Jr.), 1♂; same data as holotype but 15 Nov. 1980, (M.J. Westfall, Jr.), 19♂; same data as holotype but 17 Nov. 1980, (M.J. Westfall, Jr.), 2♂; same data as holotype but 24 Nov. 1980, (M.J. Westfall, Jr.), 4♂; same data as holotype but 28 Nov. 1980, (M.J. Westfall, Jr.), 1♂; Prov. Orellana, Parque Nacional Yasuni, Biological Research Station and surrounding forest, 7–21 Oct. 2001, (A. Rohn), 1♂ (ARC); Tiputini Biodiversity Station, 0°30'S 76°9'W, 220 meters, Sept. 2000, (Kelly Jackson, D. Inward), 5♂ (BMNH, RWG); La Selva Jungle Lodge, 100 km E Coca, streams in hill forest S of Napo River, 13 Oct. 1988, (S.W. Dunkle), 7♂ (SWD); PERU: Loreto Dept., Explorama Lodge, 50 km NE Iquitos on Amazon River, 4 July 1990, (S.W. Dunkle), 5♂, 3♀ (SWD); same data but 10 July 1990, 1♀ (SWD).

Paratypes to be placed in FSCA, LACM, BMNH, USNM, UMMZ, MNRJ, and various private collections.

Mnesarete ephippium new species

Figs. 12 (app), 53, 60 (pth), 84 (int), 104 (ab), 155 (mp)

Mnesarete n. sp. B: Louton *et al.*, 1996:437

DESCRIPTION. **Holotype Male.** Head as in *Mnesarete drepane*, entirely matte black with cupreous reflections around vertex and postfrons; base of mandible, labium, labrum, gena, and clypeus black with cupreous reflections. Occipital tubercles present but small.

Prothorax entirely black with cupreous reflections; propleural spot absent, lateral margin of hind lobe of prothorax reflexed anteriorly as in female (Fig. 53); synthorax as in *M. drepane* but with vestigial obscure narrow pale stripes along second and third lateral sutures, lower margin and venter of thorax matte black with light dusting of pruinosity on venter of thorax. Legs and armature black. Wings hyaline; venation black; pterostigma lacking; FW tip hyaline, a well-defined brown apical spot on HW; two rows of cells behind CuA in FW and HW; CuA descending posterodistally from tip of CuP and largely paralleling MP, this area enclosing one row of cells.

Anx: FW: 23/23; HW: 23/22.

Abdomen cupreous becoming darker on sides; posterior margins of segments 7 and 8 medially emarginated, lateral margins of these segments raised, middorsal carina on posterior 0.5 of 7 and 8 strongly recessed (Fig. 104); posterior margin of segment 10 with small middorsal spine. Genital ligula apical segment lacking apical lobes, with distal margin ciliate and emarginate.

Abdominal appendages (Fig. 12) black. Cercus long, robust, arcuate, with a tuft of thick, coarse hairs at mediobasal margin; medial lobe large, hemispherical, extending medially well beyond basal margin of cercus; distal fossa narrow, occupying distal 0.5 of cercus but largely hidden by thick superior ridge; in mediodorsal view transverse and superior ridges meeting at approximately a rounded acute angle; medial area between basal tuft of hairs and edge of distal fossa strongly concave, especially so by posterior margin of mediobasal lobe; cercus in lateral view gently arcuate; paraproct short, approximately 0.25 length of cercus, its tip obliquely spatulate, the tip forming a posteromedially directed tooth; in lateral view, paraproct slightly arcuate dorsally.

HW 28 mm, abdomen 38 mm.

Allotype Female. Head as in male but with following areas pale: base of first antennal segment, small spot on each side of labium, base of mandible, obscure spot on each side of labrum. Rear of head black, occipital tubercles as in male.

Prothorax as in male; propleural spot vestigial; prothoracic horn absent; hind lobe (Fig. 60) campanulate, broadly emarginated medially, lateral margin strongly reflected anteriorly (Fig. 53) so that posterior surface of lobe is visible in lateral view; intersternite (Fig. 84b) black, linear, with anterior margin slightly swollen; synthorax similar to male, but also with narrow, pale humeral stripe and one bordering ventral margin of metepimeron and obscure white spots at base of mesinfraepisternum and mesepimeron. Most of metepimeron, coxae, and venter of thorax dusted with white pruinosity. Coxae with dull white spot at posterior margins; legs and armature black. Wings as for male.

Anx: FW: 27/26; HW: 27/25.

Abdomen black with metallic luster, lateroventral margin segment 2 with obscure pale streak interrupted by black at posterior 0.7–0.8 of segment, annulus black; segments 3–5 obscurely pale ventrolaterally, dorsum of segments 8 and 9 evenly convex without a trace of middorsal carina; tip of segment 10 with middorsal spine surpassing end of segment, followed by a smaller supplementary spine dorsolateral to middorsal one; ventrolateral margin of segment with a cluster of three spines; cercus black.

HW 28 mm, abdomen 31 mm.

Paratypes. Measurements: male ($n = 6$), HW 24–27 mm, abdomen 34–37 mm, anx FW 23–27, HW 23–28; female ($n = 7$), HW 24–28 mm, abdomen 27–32 mm, anx FW 24–27, HW 22–27.

ETYMOLOGY. *ephippium*—Greek for saddle, in reference to the longitudinally depressed middorsal carina on abdominal segments 8 and 9 (Fig. 104).

DIAGNOSIS. The unique morphology of the male cerci in *M. ephippium* (Fig. 12) easily distinguish this species from all others. The only species with a similar morphology is *M. marginata*, known only from the holotype male without precise data

(eastern Peru), but the mediobasal lobe in that species is not as developed. The cercus in *M. marginata* (Fig. 23) is not as robust and the anterior portion of the transverse ridge is more pronounced than in *M. ephippium*. The paraproct in *M. marginata* is longer, linear, and terminates in a stub with a small medially directed tooth (Fig. 23d).

The female is easily distinguished from all other metallic red species within its range (*M. fulgida*, *M. drepane*, *M. hauxwelli*, *M. devillei*, and *M. metallica*) by the reflexed lateral lobe of the hind lobe of the prothorax (Fig. 53).

DISTRIBUTION (Fig. 155). Ranges along the eastern foothills from NE Ecuador (Sucumbíos Dept., Río Cuyabeno, 0°1'S 76°19'W) south to Madre de Dios Dept., Peru (12°53'S 71°14'W). Elevational data range from 490 meters (Mayalico) to 574 meters (San Martín, Río Huallaga).

REMARKS. Teneral males are more cupreous than older individuals, otherwise, I found no significant differences from the types. The allotype female is old, which probably accounts for the minimal cupreous condition of the thorax and abdomen.

I am confident that I have correctly identified females of this species. The allotype and paratype females were collected at the same locality, one on the same date as the holotype, the other on 1 December 1941. The unusual condition of the lateral lobe of the prothoracic hind lobe is similar to that in the male. The reflexed condition of the lobe in females probably accommodates the extraordinarily large mediobasal lobe of the male cercus.

BIOLOGY. Nothing recorded.

HOLOTYPE. ♂, ECUADOR: Prov. Santiago-Zamora (now Morona-Santiago), Mayalico on Río Nanganita (now Río Naganitza), 490 meters, 3°3'S 77°59'W, 2 Dec. 1941, (David B. Laddy), (UMMZ).

ALLOTYPE. ♀, same data as holotype.

PARATYPES. 6♂, 7♀, ECUADOR: Sucumbíos Dept., Río Cuyabeno, 0°1'S 76°19'W, 16–26 Feb. 1998, (G. Kareofelas), 5♂, 5♀ (ARC, RWG); same data as holotype but 2 Dec. 1941, 1♀ (RWG); PERU: San Martín Dept., San Martín, Río Huallaga Jan. 1933, ("Purchased from Paul Nagel, 1934"), 1♀ (FSCA); Madre de Dios Dept., Erika Hostel on Río Madre de Dios, near Salvación, 550 meters, 6 Sept. 1988, (Jerry A. Louton), 1♂ (USNM).

Mnesarete fulgida (Selys)

Figs. 13 (app), 85 (int), 151 (mp)

Lais fulgida Selys, 1879:365 (19 separate, description of at least a pair from "Río Napo (Écuador)")

Mnesarete fulgida: Davies and Tobin, 1984:12 (as synonym of *M. hauxwelli* [Selys])

DIAGNOSIS. This species is most similar in appendage morphology to *M. drepane* and is diagnosed under that species.

As discussed under *Mnesarete drepane*, I have been unable to recognize bona fide females of this species. I have seen females collected with males of *M. fulgida* but because of sympatry with *M. drepane*, I have refrained from assigning these females a name.

TYPES. I illustrate the appendages of the lectotype in the BMNH (Kimmins, 1969).

DISTRIBUTION (Fig. 151). *Mnesarete fulgida* occurs from S Colombia (Amazonas Dept., stream at Raudal [Rapids]) Jacamiya on Río Mesay, N of Araracuara, 0°4'37"N 72°21'36"W; west to NE Ecuador (Orellana Prov., on trail, Río Napo to Río Tiputini, opposite [SE of] Puerto San Miguel, 400 meters, 0°38'S 76°30'W) and south to the Iquitos area of Loreto Dept., Peru. Elevational data range from 90 meters (Peru, Loreto Dept., Ampiyacu [written as Estiron, Río Ampí Yacu]) to 400 meters. The species is sympatric with the closely related *M. drepane*.

REMARKS. This species, more than any other member of the metallic red group, has had a checkered taxonomic history. It was originally described by Selys (1879) but questioned as a possible race of *Lais aenea*, then (Selys, 1880) recognized it as a separate species. Fraser (1946) in his attempt to unravel the taxonomy of this species, stated that "... *fulgida* is most certainly the teneral stage of *hauxwelli*..." and:

The initial confusion arose through Selys failing to appreciate that the inferior anal appendages of *hauxwelli* were rudimentary: these, in the type, he thought to be either missing or in a "too poor condition" to be seen. The same appendages of *fulgida* were never mentioned in descriptions, so that one is led to infer that they too were either missing or in too rudimentary a condition to be observed. More confusion was added by describing a poorly defined apical marking to the hindwings of *fulgida*, described from a teneral specimen, and then contradicting this later by stating that there was no such marking. The poor condition of this latter, Selys himself explained by the teneral state of the type: a correct conjecture on his part, for it is altogether absent in teneral specimens of *hauxwelli* and of other species which bear such markings, poorly defined in more adult ones and well defined only in the full adults. Clearly, then, if a marking was present in the teneral *fulgida*, it would be well defined in the adult. Calvert, who has examined a pair labeled as *fulgida*, apparently by Hagen, states that the male bears a well-marked apical brown spot in the hind-wing and that the inferior appendages are undeveloped like *hauxwelli*. He therefore groups *fulgida* with *hauxwelli* but does not suggest that the two are synonymous.

The present collection contains examples of all four of the species mentioned above so that it has been possible to make careful comparisons and good camera lucida studies of all the anal appendages...

Fraser's illustration of *Mnesarete hauxwelli* is really that of *M. fulgida*. Fraser probably had access to the types of *Lais fulgida* and *L. hauxwelli* when reporting on these species. When I borrowed the holotype of *L. hauxwelli*, the apical abdominal seg-

ments were missing; this is not mentioned by Kimmins (1969) in his type catalog, so it is unclear whether Fraser was able to determine the identity of *L. hauxwelli* from the type. As discussed under *M. hauxwelli*, Selys' description of this species makes clear that *M. fulgida* and *M. hauxwelli* are distinct.

BIOLOGY. Through the kindness of Jerrell J. Daigle I have abstracted his notes on the capture of this species in July 1996 at Parque Nacional Yasuni (Ecuador: Orellana Prov., stream 3.6 km N of Yasuni Biological Research Station on Main Road): "Not as wary as *M. drepane*. Not seen with other species of *Mnesarete*. Congregates in rare open sunny clearings about 2.6 m in diameter in otherwise shady, impenetrable narrow streams/trickles averaging about 1 m wide and 30 cm deep. These lowland floodplain rainforest streams are clear but with deep muddy bottoms. One usually sinks down to knee level in these streams. Lots of brambles, vines, and fallen trees make net swinging impossible except in clearings. Companion genera included: *Protoneura*, *Perissolestes*, *Philogenia*, *Mecistogaster*, and *Heteragrion*."

OTHER MATERIAL EXAMINED. COLOMBIA: Amazonas Dept., Stream at Raudal (Rapids) Jacamiya on Río Mesay, N of Araracuara, 0°4'37"N 72°21'36"W, 4 July 1996, (G. Pritchard, J. Zloty), 1♂ (RWG); ECUADOR: Orellana Prov., on trail, Río Napo to Río Tiputini, opposite (SE of) Puerto San Miguel (lowland primary forest but with all cocoa plants dug up by local indians), 400 meters, 0°38'S 76°30'W, 20 July 1980, (Herman G. Real), 3♂ (RWG); Scientific Research Station, Yasuni National Park, small stream at km 38 on Yasuni Road, Collected under Permit 027 1C INEFAN/DNANVS, 0°38'0"S 76°30'0"W, 12 June 1995, (S.W. Dunkle), 1♂ (RWG); Scientific Research Station, Yasuni National Park, 180 meters, 0°38'S 76°30'W 7–21 Nov. 2001, (Andrew Rehn), 1♂ (ARC); PERU: Loreto Dept., Ampiyacu (written as Estiron, Río Ampí Yacu), 90 meters, 3°51'55"S 70°41'19"W, 29 Mar. 1970, (B. Malkin), 2♂, 1♀ (RMNH); same data but 15–22 May 1966, 1♀ (RMNH); Iquitos, Río Amazonas, 106 meters, 3°46'S 73°15'W, June 1939, (Guillermo G. Klug), 2♂ (RWG); same data but July 1939, 6♂, 2♀ (UMMZ); same data but Jan. 1940, 1♂ (UMMZ); same data but Apr. 1940, 2♂, 1♀ (UMMZ); same data but May 1940, 2♂, 1♀ (UMMZ); streams along road W of Iquitos (rain forest streams and pool areas at road x-ing; mud-sand bottom, black water), 150 meters, 3°51'S 73°11'W, 17 Aug. 1986, (Jerry Louton), 1♂ (USNM).

Mnesarete fuscibasis (Calvert)
new combination

Figs. 14 (app), 86 (int), 100 (th), 113 (wi),
131 (li), 132 (by), 150 (mp)

Hetaerina fuscibasis Calvert, 1909:81–84, plate I,
figs. 1, 2; plate IX, figs. 152, 153 (description of

"2♂ and parts of six others, 2♀ and parts of six others" from Chapada, Brazil)

DIAGNOSIS. This species is most similar in appendage morphology to *Mnesarete pudica*. In both, the anterior portion of superior ridge extends diagonally toward and often meets the medial portion of transverse ridge (Figs. 14, 25); in all other species in this genus (except *M. rhopalon* [Fig. 27] Whose appendage morphology is distinctive), the anterior portion of the superior ridge is either isolated (*M. lencionii* [Fig. 20], *M. pruinosa* [Fig. 25], and *M. smaragdina* [Fig. 28]) or continuous along its entire length, meeting the outer portion of the transverse ridge (*M. hyalina* [Fig. 19], *M. grisea* [Fig. 15], *M. machadoi* [Fig. 22]). Both *M. fuscibasis* and *M. pudica* are the only species thus far known which have a genital ligula with vestigial apical lobes (Figs. 131b, 134b); in all others, no apical lobes are present. Specific differences between males of *M. fuscibasis* and *M. pudica* are diagnosed in couplet 12 in the "Key to males." Both species are unique in possessing various degrees of wing markings; red in *M. pudica* (Figs. 117, 133), black in some populations of *M. fuscibasis* (Figs. 113, 132a).

Male appendages of *M. fuscibasis* and *M. pudica* are also strikingly similar to *Hetaerina simplex* Selys (Fig. 141), but males of *H. simplex* differ in having some degree of red basal wingspotting and in lacking apical lobes on the distal segment of genital ligula. Kennedy (1919) states that "traces of these apical lobes also occur in *Hetaerina simplex*" but they were not present in the one male I examined.

The relatively broad wings ("Key to females", couplet 4) will separate females of *M. fuscibasis* and *M. pudica* from all others in this genus. The offset condition of the pale humeral stripe (Fig. 100) also is unique. Females of *M. fuscibasis* approach those of *M. pudica*, but the wings are relatively narrower ("Key to females", couplet 5); I have been unable to detect any other morphological characters with which to separate them. Great ontogenetic change can occur in the females of both species. Wings of older females of *M. pudica* become heavily infumated, but those of *M. fuscibasis* become infumated at the basal half; juvenile females of both species can possess similar wing coloration. *Mnesarete fuscibasis* and *M. pudica* have overlapping distributions (Fig. 150); both have been collected in southern Mato Grosso (Chapada) and Goiás (Jataí) states.

Females of *M. fuscibasis* and *M. pudica* are easily distinguished from females of *Hetaerina simplex* (if I have correctly identified the female sex of this species [see Garrison, 1990]) by the differences in wing widths (narrower in *H. simplex*); and different thoracic design (brilliant metallic green on mesepisternum with wide oblique pale stripe over humeral suture, as in fig. 134a in Garrison [1990]).

TYPES. I illustrate the appendages of a syntype

male in the CM. It is the same specimen figured in color by Calvert (1909) on plate IX, fig. 152. In order to clarify application of the name, I designate the syntype male as LECTOTYPE.

DISTRIBUTION (Fig. 150). *Mnesarete fuscibasis* is thus far known from the Chapada region (15°34'–49°S 56°4'–55°13'W) in S Mato Grosso State and the vicinity of Jataí (17°53'S 51°43'W) in S Goiás State in Brazil from elevations of 194–800 meters.

REMARKS. Based on the broad HW length-to-width ratio and the presence of rudimentary apical lobes on the genital ligula, this species is closely related to *M. pudica*, despite possessing basal black wing markings instead of red. The series of six males from Jataí differ from those from Mato Grosso State in possessing hyaline wings (Fig. 113c). The appendages of all are identical. These reasons justify its placement in *Mnesarete*, rather than *Hetaerina*.

OTHER MATERIAL EXAMINED. BRAZIL: Goiás State, Riacho Jataí, 686 meters, 17°53'S 51°43'W, 12 Oct. 1982, (N. Santos, L.F. Neto, Dácio), 6♂ (MNRJ, RWG); Mato Grosso State, Mt. Tirossa, Chapada, ca. 20 km ENE of Ciuba, 194 meters, 15°35'S 56°5'W, 1 Feb. 1986, (A.B.M. Machado), 2♂, 2♀ (RWG); Brasília, Cuiabá, 100 km E, Jacaira 30 km W, Pensão Seca, Córrego Ajuricaba, 800 meters, 15°49'27"S 55°13'5"W, 2 May 1993, (M. Wantzen), 1♂ (RWG); same data but 5 Nov. 1993, (M. Wantzen), 1♂ (RWG); same data but 14 Jan. 1994, (M. Wantzen), 1♂ (RWG); same data but 17 Feb. 1994, 1♀ (RWG); same data but 4 May 1994, 1♀ (RWG); Brasília, Cuiabá?, 800 meters, 15°49'27"S 55°13'5"W, (M. Wantzen), 1♀ (RWG).

Mnesarete grisea (Ris)

Figs. 15 (app), 44 (li), 70 (pth), 87 (int), 101 (th), 136 (larva), 149 (mp)

Lais grisea Ris, 1918:41–43, figs. 14–17 (description of 5♂, 3♀ from Argentina)

Mnesarete grisea: Fraser, 1947a:432

DIAGNOSIS. The long paraproct ending in a recurved tooth (Fig. 15), pale thoracic coloration (Fig. 101a), and distribution (Bolivia, NW Argentina; Fig. 149) easily distinguish males of this species.

Reduced metallic coloration (Fig. 101b), pale bilobed condition of the intersternite (Fig. 87), and distribution (Bolivia, NW Argentina; Fig. 149) allow for identification of females from other species of *Mnesarete*. The reduced metallic coloration of female *M. grisea* may cause it to be confused with the sympatric *Hetaerina charca* Calvert and *H. rosea* Selys. Females of *H. charca* have a largely red metallic thorax (largely gray thorax with narrow stripes of dull metallic green in *M. grisea*; Fig. 101b), and the intersternite is subequally bilobed (Fig. 139) compared to the relatively longer posterior lobe for *M. grisea* (Fig. 140). Thoracic patterns for *M. grisea* may approach those for females of *H.*

rosea, but the intersternite in *H. rosea* is subequally bilobed with an anteriorly reflexed lobe; that of *M. grisea* has a relatively longer posterior lobe, and the smaller anterior lobe is not reflexed.

TYPES. In order to clarify application of the name, I designate as LECTOTYPE a male (Figs. 15, 101a) with the following data: Argentina, Salta Prov., Orán, 340 m, 22 July 1913 (Joergensen). It is the same specimen figured by Ris (1918:42, fig. 16) and labeled "Type" in his own hand. In FNS.

DISTRIBUTION (Fig. 149). Confined to the eastern foothills of the Andes from central Bolivia (Santa Cruz Dept.; Florida Prov.; Río El Fuerte, E of Samaipata, 1799 meters, 18°9'S 63°52'W) south through Jujuy, Salta, Catamarca, Tucumán, and La Rioja provinces in NW Argentina. The southernmost locality is Catamarca Prov., San Lorenzo, 519 meters, 28°28'S 65°47'W. Elevation ranges from 340 meters (Orán) to 1799 meters (Río El Fuerte, E of Samaipata).

LARVA (final larval stadium specimens; some with swollen wing pads, and reared larval skins). Head in dorsal view (Fig. 136b) tan with postero-lateral margin broadly convex; in lateral view with strongly developed postocular tubercle and with irregular longitudinal dark stripe posterior to compound eye (pale and almost nonexistent in some specimens). Antenna (Fig. 136a) approximately 1.5× longer than head, with seven segments, segment 1 the longest; prementum petiolate, strongly projecting medially with a strongly developed cleft extending to base of palp; prementum (Fig. 136c) when appressed extending to anterior margin mesothoracic coxae, one premental seta, marginal setae zero, palpal setae two or three; palpal lobes gently convex (Fig. 136c) with three well-developed palpal teeth (Fig. 136d); mandibles (Fig. 136e, f) with following formula: L 12345 0 a(m)/b/R 12345 y a(m¹⁻ⁿ)/b; denticulate pattern on right molar crest variable (N = 2–4). Thorax tan, with dark irregular lateral stripe, propleural tubercle prominent; legs tan with a pair of darker bands each on femur and tibia. Wing pads extending to middle of abdominal segment 4. Abdomen largely pale with two pairs of midlateral dark spots on intersegmental membranes, no posterodorsal hooks on abdominal segments 4–9, a middorsal hook on 10; lateral spines on 8–10. Gonapophyses not extending past segment 10; male cercus (Fig. 136h) linear. Dorsal lamella with sides parallel, about 0.75 length of lateral lamella, its tip rounded, with irregular patterns of dark gray occupying most of lamella as shown in Fig. 136i; lateral lamella (Fig. 136j) moderately long, almost parallel, with strongly acuminate tip, pattern as for dorsal lamella; dorsal lamella 7 mm; lateral lamella 8–9 mm. Total length of larva excluding lamellae 17–22 mm.

Differentiation of the larva of *M. grisea* from *Ormenophlebia imperatrix* is found in the lack of dorsal hooks on abdominal segments 4–9 (present in *O. imperatrix*), and presence of a dorsal protuberance on abdominal segment 10 (an aborted keel in

O. imperatrix). The right mandibular molar crest of *M. grisea* contains fewer denticles (2–4) compared to that of *O. imperatrix* (6–10).

I have not found any characters that separate the larva of this species from all species of *Hetaerina* thus far described. This is not surprising, given the close similarity between adults of *M. grisea* to some species of *Hetaerina* (e.g., *H. charca* Calvert). *Mnesarete grisea* keys to couplet 8(7) in Zloty *et al.* (1993) and couplet 9 in Novelo-Gutiérrez (2000), which leads to *Hetaerina occisa* Selys and *H. titia*. The larva of *M. grisea* lacks any long, fine hairs (*H. occisa*), or any stiff setae (*H. titia*) on antennal segment 1 (Fig. 136a). The lateral lamella in *M. grisea* when viewed dorsally (Fig. 136g) is not noticeably widened, as is depicted for *Hetaerina caja dominula* (Geijskes, 1943) or *H. auripennis* (Santos, 1970a), but descriptions of these and other species are not detailed enough for further comparisons.

Described from 10 males and 10 females from Argentina (8♂, 9♀, Salta Prov., Lesser, unnamed stream, 24°40'57"S, 65°28'39"W, 8 Apr. 1998; some of these emerged in laboratory by 15 Apr. 1998, all collected by N. von Ellenrieder); 1 reared male, Cafayate, 2 Dec. 1986; 1 male and 1 female (latter specimen reared), La Rioja Prov., Sañogasta, 5 Dec. 1986, all collected by A.R. Capitulo.

REMARKS. None.

BIOLOGY. Adults often common when found. Both sexes perch on blades of grass or snags near stream's edge. Females found further back in shady areas of forest.

MATERIAL EXAMINED. ARGENTINA: Jujuy Prov., Calilegua, 446 meters, 23°47'S 64°47'W, Nov. 1945, 1♀ (BMNH); same data but 8 Dec. 1986, (Rodrigues Capitulo & Spinelli), 1♂ (MLP); Jujuy, 1200 meters, 24°11'S 65°18'W, Apr. 1911, 1♀ (FNS); La Rioja Prov., Sañogasta, 804 meters, 22°4'S 63°43'W, 5 Dec. 1986, (A. Rodriguez Capitulo), 2♂, 1♀ (MLP, RWG); Salta Prov., Cafayate, 1585 meters, 26°5'S 65°58'W, 2 Dec. 1986, (G. Jurzitza), 1♂ (MLP); Chicoana, Quebrada de Tilin, 1433 meters, 25°6'S 65°33'W, 27 Jan. 1989, (G. Jurzitza), 1♀ (LNK); same data but 2 Feb. 1989, (G. Jurzitza), 1♂ (RWG); Lesser, arroyo de piedras, 1312 meters, 24°40'57"S 65°28'39"W, 8 Apr. 1998, (N. von Ellenrieder), 1♂ (NVE); same data but 24 Apr. 2001, (N. von Ellenrieder), 1♂ (MLP); Lumberras, Río Juramento, 645 meters, 25°11'6"S 64°55'0"W, 9 Apr. 1998, (N. von Ellenrieder), 1♀ (MLP); Ruta Nac. 57, km 21, 700 meters, 23°7'S 64°16'W, (P. Fidalgo), 1♀ (RWG); Salvador Mazza, 804 meters, 22°4'S 63°43'W, Nov. 1986, (A.E. Espitolo), 1♂, 1♀ (RWG); "Aragon [probably vic. Río Aragon, near Salamanca], 900 m[eters]," 29 May 1913, (Joergensen), 1 paralectotype ♀ (FNS); Morenillo, 26°12'S 64°51'W, Mar. 1936, 1♀ (BMNH); Tucmán Prov., Trancas, San Pedro de Colalao, Tacanas River, 1056 meters, 26°14'S 65°29'W, Jan. 1947, (P. Arnau), 7♂ (BMNH); same data but Jan. 1949, 1♂ (FML); same data but Jan. 1953, 1♂ (FML); La Aguadita, 27°9'S 65°11'W, 25

Apr. 1971, (Fidalgo), 1♂ (MLP); San Pedro de Colalao, 1056 meters, 26°14'S 65°29'W, Jan. 1953, (P. Arnau), 1♂ (RWG); same data but (Waltz), 1♂, 1♀ (RWG); stream on Hwy 307, 750 meters, 27°6'0"S 65°37'6"W, 8 Jan. 1997, (T.W. Donnelly), 1♂ (RWG); Monte Bello, 294 meters, 27°14'S 65°7'W, Nov. 1947, (Willink, Golbach), 6♂ (BMNH); BOLIVIA: Santa Cruz Dept., Florida Prov., Río El Fuerte, E of Samaipata, 1799 meters, 18°9'S 63°52'W, 5 Nov. 1998, (K.J. Tennessen), 2♂, 2♀ (KJT).

Mnesarete guttifera (Selys)

Figs. 16 (app), 88 (int), 102 (th), 158 (mp)

Lais guttifera Selys, 1873:475–476 (11–12 separate, description of unspecified number of males and one female from "S. João del Rey (Brésil). Prise en novembre 1872 par Walther de Selys")
Mnesarete guttifera: Davies and Tobin, 1984:13

DIAGNOSIS. The unique appendages (Fig. 16) distinguish this species from all other males except for *Mnesarete mariana* (see below).

Females most closely resemble *M. hyalina* and *M. pruinosa*, but those species usually have a prothoracic horn (lacking in *M. guttifera*), and the intersternite is broad and has a well-developed shoulder in *M. hyalina* (Fig. 90b) and *M. pruinosa* (Fig. 95) (intersternite similarly shaped [Fig. 88] but dark in *M. guttifera*). Females of *M. guttifera* have less extensive areas of metallic green on the thorax (Fig. 102) compared to *M. pruinosa* and *M. hyalina*. However, when fully mature, pale areas of the thorax in females of *M. guttifera* become completely dark, while visible pale lines around the thoracic sutures remain pale in *M. pruinosa* (Fig. 103b) and *M. hyalina*. Some juvenile females of *M. guttifera* have a largely pale thoracic venter that also becomes dark when fully mature.

TYPES. In order to clarify application of the name, I designate as LECTOTYPE a male (Fig. 16) with the following data (handwritten on green label): "S João d[el] R[ey]/W[alther de Selys]." Paralectotype female with same data but also with white handwritten label: "*Lais guttifera* Selys/♀ S. João del Rey/(W.)" In IRSNB.

DISTRIBUTION (Fig. 158). Widely distributed in south-central Brazil from Goiás State (24 km E Formoso, 13°37'S 48°54'W) west to Mato Grosso State (Cuiabá, 12 km from Buriti, 15°35'S 56°5'W) south to Paraguay (Paraguari Dept., 25 km SE Ybycui; Parque Nacional Ybycui, 26°1'S 57°3'W) at elevations from 121 meters (Ybycui) to 1144 meters (Goiás State, P. N. dos Veadeiros, São Bartolomeu).

REMARKS. Machado (1996) described *Mnesarete mariana* from three males from Chapada Diamantina, Capão, Palmeiras, Bahia State, Brazil (13°34'S 41°38'W) stating that it "... is close to *M. guttifera* (Selys, 1873) but differs from it mainly by structure of the inferior anal appendages and by the presence of a tuft of hairs on each side of the

hind part of the anterior lamina adjacent to the anterior hamules." In the original description the paraprocts of *M. mariana* are stated to be truncate, not acuminate as in *M. guttifera*.

At my request, Dr. A.B.M. Machado sent me a fourth male (topotype) of *M. mariana*, which he accidentally overlooked when making up his description. I examined 21 males (including the lectotype) of *M. guttifera* from 11 different localities. After examining all of this material, I am skeptical of specific status for *M. mariana*. The character pertaining to the anterior lamina (tuft of hairs present on either side of hind part of anterior lamina) is absent on the topotype of *M. mariana*. I have seen no differences in the anterior lamina between the topotype and the series of male *M. guttifera* I examined.

More northerly specimens of *M. guttifera* from Chapada (Fig. 16) are intermediate between *M. mariana* (Fig. 17) and typical *M. guttifera* (Fig. 16; lectotype). The length and formation of the paraproct varies in shape. The topotype of *M. mariana* possesses the most vestigial rounded tip compared to all others, but this character might result from geographic (clinal?) variation. Janira Costa kindly wrote to me (14 July 2002):

I have seen the type of *M. mariana* and two other specimens from Bahia. I have also seen 161 specimens of *M. guttifera* from different states of Brazil (São Paulo, Paraná, Goiás, Mato Grosso, Minas Gerais, and Bahia). The specimens from Bahia are identical to the *M. mariana* holotype. The other specimens from the other states are identical to *M. guttifera*. The differences are in the paraprocts. The specimens from Mato Grosso are identical to *M. guttifera*, but some specimens present variations. One specimen from Chapada is very similar to *M. mariana*, but it may be separated from *guttifera*. I believe it is necessary to examine more specimens from Bahia. At the moment, based on two specimens from Bahia and the holotype, I prefer to consider *M. mariana* a valid species.

While I still question the distinctness of *M. mariana*, I refrain from formally synonymizing it with *M. guttifera* pending examination of more material from Bahia State.

BIOLOGY. According to Frederico Lencioni (*in litt.*), *M. guttifera* occurs in forested areas on narrow (never more than 2 meters wide) clear-water shallow creeks with water falls and with a bottom consisting of mud and/or stones. This species was collected with *Argia mollis* Hagen in Selys, *Argia modesta* Selys, *Oxyagrion chapadense* Costa, *Oxyagrion terminale* Selys, *Acanthagrion gracile* (Rambur), and *Lestes dichrostigma* Calvert.

OTHER MATERIAL EXAMINED. ARGENTINA: Misiones Prov., Iquazú, 161 meters, 25°34'S 54°34'W, Dec. 1981, (no collector), 1♂ (RWG); BRAZIL: Distrito Federal, Brasília, Exc. 221 col. 13 Riacho do Corguib, 15°45'S 47°57'W, 26 Nov. 1963, (N. Santos, A.B.M. Machado, Bozjes), 1♂ (MNRJ); Goiás State, 24 km E of Formoso, 519 meters, 13°37'S 48°54'W, 18 May 1956, (F.S. Trux-

al), 1♂ (RWG); Mato Grosso State, afluentes do Rio Casca, cerca de 20 km da Chapada rumo à Usina do Rio Casca, 701 meters, 15°27'S 55°21'W, no date, 1♂ (RWG); Buriti: Chapada dos Guimarães, 690 meters, 15°26'S 55°45'W, 18 Feb. 1967, (Nizton [?]), 1♂ (RWG); same data but 19 Aug. 1983, (Ebert), 1♀ (RWG); same data but 19 June 1927, (C. Longfield), 1♂ (BMNH); Minas Gerais State, São João del Rei, 21°8'S 44°15'W, Nov. 1872 (Walther Selys), 1 paralectotype ♀ (IRSNB); Belo Horizonte, Caixa de Areia, 875 meters, 19°55'S 43°56'W, no date, (N. Dos Santos, A.B.M. Machado), 1♂ (RWG); Riacho na [vicinity of?] Estrada S. Joao del Rei, 860 meters, 21°8'S 44°15'W, 1 Apr. 1961, (N. Dos Santos, A.B.M. Machado), 1♂ (RWG); São Paulo State, Pirassununga, Emas, Vassadouro da Represinha, 609 meters, 21°59'S 47°25'W, (Frederico A. Lencioni), 2♂ (RWG); Rio Claro, 608 meters, 22°24'S 47°33'W, 19 Oct. 1996, (Frederico A. Lencioni), 2♂ (RWG); same data but 20 Oct. 1996, 2♂ (RWG); same data but 26 Oct. 1996, 1♂ (RWG); same data but 10 Nov. 1997, 1♀ (RWG); same data but 15 Nov. 1997, 3♂, 2♀ (RWG); same data but 16 Nov. 1997, 1♀ (RWG); Rio Claro, Sitio Primavera, 569 meters, 22°24'33"S 47°36'44"W, 28 July 1997, (Frederico A. Lencioni), 1♂, 1♀ (RWG); São Carlos, 766 meters, 22°1'S 47°54'W, 24 Feb. 1978, (M.M. Dias F.), 1♂ (RWG); PARAGUAY: Paraguari Dept., Ybycui, 25 km SE; Parque Nacional Ybycui, 121 meters, 26°1'S 57°3'W, 12–24 Apr. 1980, (P.J. Spangler), 4♂ (USNM, RWG).

Mnesarete hauxwelli (Selys)

Figs. 18 (app), 45 (li), 54, 61, 71 (pth), 89 (int), 151 (mp)

Lais hauxwelli Selys, 1869:654 (10 separate, description of ♂ from "Peba sur le haut Amazone (par M. Hauxwell).")

Mnesarete hauxwelli: Fraser, 1946:28–30, fig. 3

DIAGNOSIS. The combination of the rudimentary paraproct and the sharp triangular medial lobe of the cercus (Fig. 18) easily distinguish this species from all others. The medial lobe of *M. loutoni* (Fig. 21) is similarly shaped, but *M. hauxwelli* lacks the sinuous basal HW margin (Fig. 115a) and fully developed paraproct.

I have associated a small series of females collected with males of *M. hauxwelli* as representing this species. The bilobate condition of the intersternite (Fig. 89) and prominent lateral lobe on the lateral margin of the hind prothoracic lobe (Figs. 54, 61) differentiate these females from similar cupreous females positively identified (taken in areas where only those species occur, or in tandem or copula with identified males) of *M. aenea*, *M. cupraea*, *M. devillei*, *M. drepane*, *M. ephippium*, and *M. metallica*.

TYPES. When I examined the holotype of *Lais hauxwelli* in the BMNH (Kimmins, 1969), it lacked

abdominal segments 8–10. Further comments on *M. hauxwelli* are included under *M. fulgida*.

DISTRIBUTION (Fig. 151). *Mnesarete hauxwelli* occurs from the eastern slopes of the Andes in central Ecuador (Pichincha Dept., Quito, 2763 m, 0°13'S 78°30'W) east to Peru (Loreto Prov., Pebas, 97 m, 3°20'S 71°49'W [type locality]) and south through southern Ecuador (Zamora Chinchipe Prov., Zumba, Río Zamora, 1255 m, 4°52'S 79°9'W). Elevational data range from 97 m (Pebas) to 1700 m (Ecuador, Tungurahua Dept., Guama Yacu, 1°24'S 78°25'W). The species is sympatric with *M. drepane*, *M. ephippium*, *M. fulgida*, *M. devillei*, and *M. metallica*.

REMARKS. This species masqueraded under the name *M. fulgida*, as explained under that species. The confusion was probably started by Fraser (1946), who erroneously synonymized *M. fulgida* under the older name *M. hauxwelli*. The large series of specimens in the Kennedy collection at the UMMZ were not recognized as this species.

Despite the taxonomic confusion, Selys' (1869: 654, 10 separate) original description of the appendages identifies this species as follows (translated from the French):

Superior appendages slightly curved, with 5–6 spines on external margin. Viewed ventrally, the internal margin has a straight dilation from the base ending suddenly at a third the length of the appendage by a truncated and hairy tooth followed by a *strong triangular tooth pointed at its half* [italics mine]. The curved extremity is almost flattened and straight [planar] in height. Inferior appendages (deteriorated) short in appearance.

Selys again (1880:1) clarified the taxonomy of this species as follows (translated from the French):

Several specimens from the area of Esmeraldas [sic! Esmeraldas] (Ecuador) sent by M. De Ville, show that the inferior appendages are not only *short in appearance*, as I described for the type which had them deteriorated, but they are in reality *rudimentary or almost null* [Selys' italics]. This character together with that of the very strong and pointed tooth along the medial margin, differentiates *Hauxwelli* from all the other species. The tips of the superior appendages are regular [normal] but moderately curved toward each other.

The character of the sharp, triangular medial lobe described in both passages above also was verified by drawings of one of the Esmeraldas males (determined by Selys) examined by B.E. Montgomery during his trip to European museums (Montgomery, 1969) to verify the identity of various types of Calopterygidae.

BIOLOGY. Abstracted notes from Jerrell J. Daigle (Ecuador, Napo Prov., stream 47.4 km W of Loreto on Loreto Road): "Not wary; higher elevations (1000–1200 meters) on rocky, moderately steep, shady streams about 1.5–3 meters wide and 30 centimeters deep with some mud and bedrock. Present at the few sunny clearings. Not seen with other species of *Mnesarete*. Found with many *Polythore concinna* McLachlan, *Argia dives* Förster, and *Argia variegata* Förster."

OTHER MATERIAL EXAMINED. ECUADOR: Morona Santiago Prov., Mayalico, Río Nanganita, 490 meters, 3°3'33"S 77°59'44"W, 2 May 1941, (David B. Laddey), 1♂ (RWG); Napo Prov., Archidona, Río Jollin, 604 meters, 0°55'S 77°48'W, 16 July 1931, (no collector), 2♂ (RWG); Las Palmas, on Río Anzu (Río Napo watershed), 900 meters, 1°4'0"S 77°48'0"W, 18 Sept. 1936, (William Clarke-MacIntyre), 1♂ (RWG); same data but 11 Dec. 1936, (William Clarke-MacIntyre), 2♂ (RWG); Río Napo watershed, 900 meters, 1°0'S 78°0'W, 12 Nov. 1936, (William Clarke-MacIntyre), 6♂ (UMMZ); same data but 24 Dec. 1936, 1♂ (RWG); La Selva, 100 km E Coca, streams in hill forest S of Napo River, 262 meters, 0°32'24"S 76°32'24"W, 13 Oct. 1988, (S.W. Dunkle), 2♂ (SWD); stream 47.4 km W Loreto, 1100 meters, 0°40'S 77°19'W, 15 July 1996, (J.J. Daigle), 2♂ (JJD); Pastaza Prov., El Partidero, indian village on east bank of Río Anzu, jct. of trails from Mera and Puyo northward to Napo, 800 meters, 1°17'S 77°0'W, 3 Feb. 1936, (William Clarke-MacIntyre), 2♂ (RWG); same data but 24 July 1935, 1♂; same data but 29 Sept. 1935, 3♂; same data but 4 Sept. 1935, 1♂; same data but 11 Sept. 1935, 3♂ (RWG, UMMZ); Puyo, Río Pastaza watershed, 980 meters, 1°28'S 77°59'W, 20 Nov. 1936, (William Clarke-MacIntyre), 10♂ (LACM, RWG, UMMZ); same data but 26 Nov. 1936, 1♂ (RWG); same data but 28 Nov. 1936, 1♂; same data but 20 Nov. 1948, 1♂ (RWG); Morona Santiago Prov., Man-gosisa, Río Upano, 708 meters, 2°31'28"S 77°53'41"W, (Leopoldo Gómez Alonzo), 28♂, 1♀ (RWG, UMMZ); Sucumbíos Prov., Limoncocha on Río Napo, 269 meters, 0°24'S 76°37'W, 24 Aug. 1980, (Sid Dunkle), 1♂, 1♀ (SWD); Tungurahua Prov., Guama Yacu, 1700 meters, 1°24'S 78°25'W, 9 Nov. 1935, 5♂ (RWG); Zamora Chinchipe Prov., Zumba, Río Zamora, 1255 meters, 4°52'S 79°9'W, 28 Oct. 1941, (David B. Laddey), 2♂ (UMMZ); same data but 29 Oct. 1941, 1♂; same data but 30 Oct. 1941, 3♂; same data but 1 Nov. 1941, 3♂; same data but 3 Nov. 1941, 1♂ (RWG, UMMZ); PERU: Loreto Dept., Pebas, 97 meters, 3°20'S 71°49'W, (Hauxwell), 1♂ (BMNH); Iquitos, Río Amazonas, 106 meters, 3°46'S 73°15'W, (Guillermo G. Klug), 1♂ (JB).

Mnesarete hyalina (Hagen in Selys)

Figs. 19 (app), 39 (ha), 47 (he), 63, (pth), 90 (int), 114 (wi), 156 (mp)

Laïs hyalina Hagen in Selys, 1853:28 (description of incomplete male from "Bresil")

Mnesarete hyalina: Cowley, 1934b:201

DIAGNOSIS. This poorly known species is most similar to *Mnesarete pruinosa*, *M. machadoi*, and *M. lencionii*. The absence of a pterostigma will immediately separate it from *M. lencionii*. The medial lobe in *M. machadoi* (Fig. 22) is broadly arcuate and more distally located than in *M. hyalina* (Fig. 19), and *M. machadoi* possesses a fully developed

transverse ridge, which is lacking in *M. hyalina*. The male appendages closely resemble those of the sympatric *M. pruinosa*, but they may be distinguished as follows: In *M. hyalina* (Fig. 19), the anterior portion of the superior ridge is well developed and is continuous with remainder of the superior ridge; in almost all *M. pruinosa* (Fig. 25), the anterior portion of the superior ridge is greatly reduced and is disjunct from the distal fossa. The two males of *M. hyalina* I illustrate here also lack any vertical ridge, which is present to some degree in *M. pruinosa*. The tip of the paraproct in *M. hyalina* is enlarged, forming a small club; that of *M. pruinosa* forms a normal truncate process armed with two or three small recurved teeth. Finally, the base of the wings in *M. pruinosa* possesses a milky white spot (Fig. 116); the base of the wings is hyaline in *M. hyalina* (Fig. 114).

I have been unable to differentiate the one female of *M. hyalina* (Fig. 90) in IRSNB (collected with a male [see Selys, 1873:477]) from females of *M. pruinosa*.

TYPES. The holotype of *Lais hyalina* is a fully adult male lacking the last four abdominal segments labeled from "Bresil." The only clue to its type locality is a comment by Selys (1854:93) who states: "... It is from the Vienna Museum and is indicated from Brésil (P. B.). . .". The initials "P. B." probably refer to Paul de Borchgrave (see under *M. borchgravi*), although Fraser (1947b:672), in discussing labels from type specimens of *Epigomphus paludosus* Hagen in Selys, mentions that "... 'P. B.' in all probability refers to P. Besehke, the collector of the type mentioned in the Mon[ographie des] Gomph[ines].". However, according to Horn and Kahle (1935:17–18) and Horn *et al.* (1990:38), "P. Besehke" may refer either to Christian Friedrich Carl Bescke, whose collections of insects were from Brazil (area around Rio de Janeiro) before 1832, or Carl Heinrich Bescke whose collections were from Brazil and Bahia from 1821 and before. St. Quentin (1970:275) in his type catalog quotes the following label for *Libellula basalis* Burmeister: "L. basalis Br. capta C I [Italics mine] Beske prope Rio de Jan. Brasilia." I received the following information about the possible type locality of this species from Dr. A.B.M. Machado (personal communication 15 August 1996):

I agree with you that the correct identification of Selys' *hyalina* is very difficult not only by lack of the appendages but also because the type locality has not been stated. Indeed I think that the specimens from Teresópolis identified by Selys as *hyalina* are more likely to be conspecific with the holotype from Vienna than the one from Goiás identified as *hyalina* [= *M. machadoi*] by Santos. By the time the type was collected (i.e., before 1853) the region of north Goiás where Santos' specimens came from was remote and virtually inaccessible and I don't know of any expedition having gone there. On the other hand, Teresópolis near Rio de Janeiro, was already a flourishing village frequently visited by important people who came to Rio. On the other hand [*M. machadoi*] apparently does not occur in

the more collected regions of south Goiás (Jatáí, Mineiros, Dianópolis) from where I have a good series of *M. guttifera*. I have in my collection a single male which I identified as *hyalina* whose appendages correspond exactly with your drawing of Selys' specimens from Teresópolis. My specimen was collected in Aiuruoca at the Mantiqueira Mountains, in the same zoogeographical region of Teresópolis. I have compared this specimen with my large series of *M. pruinosa* from South Brazil (Parana and Rio Grande do Sul) and I think that, although very close, it is a different species. In my *hyalina* the inferior appendages are longer and reach the posterior part of the median lobe of the superiors whereas in *pruinosa* they reach only the anterior part. On the other hand in my *hyalina* (unfortunately a single specimen) there is a complete and well defined transverse ridge barely represented in *pruinosa*.

DISTRIBUTION (Fig. 156). Based on supplementary specimens determined by Selys (1873) and the information on the type locality *M. hyalina* would seem to be confined to the region of Teresópolis, Rio de Janeiro State in S Brazil.

REMARKS. I have accepted Selys' restriction of this species to specimens he subsequently identified as this species in 1873. Concerning these specimens, Selys states (translated from the French):

N.B. I no longer have before me the incomplete type of the Vienna Museum which served M. Hagen for the establishment of the species, but I, nevertheless, do not doubt the identity of the [Vienna] male of which I have been able to complete today the description. It differs well from *L. pruinosa* in the slender size, the black labium, the narrower wings and the absence of the obscure subcostal band. The female of *hyalina* is distinguished by the narrower wings.

I illustrate appendages of two males, both determined by Selys, one from the BMNH ("*hyalina*/Tersepolis/W[althère de Selys]") and another with the same data from the IRSNB (Fig. 19). Both are identical in appendage morphology and, as stated above, conform to a specimen from the same region in the collection of A.B.M. Machado. I also illustrate the head (Fig. 47), details of the hind lobe of the prothorax and left mesostigmal plate (Fig. 63), left intersternite (Fig. 90a), base and wingtip of the right FW (Fig. 114), and hamular process of the holotype (Fig. 39).

Specimens of what I am calling *Mnesarete machadoi* were first collected by Santos in Goiás State and identified by him as *M. hyalina*. The reasons for excluding this species as possibly representing *M. hyalina* are convincingly argued by Machado, as quoted above.

BIOLOGY. Nothing recorded.

OTHER MATERIAL EXAMINED. BRAZIL: São Paulo State, Teresópolis, 1668 meters, 22°26'S 42°59'W, (Walthère de Selys), 1♂, 1♀ (IRSNB); same data but 1♂ (BMNH).

Mnesarete lencionii new species

Figs. 20 (app), 46 (li), 91 (int), 157 (mp)

DESCRIPTION. Holotype Male. Head entirely matte black covered with a light uniform dusting

of gray pruinosity; base of mandible, lateral and basal portions of labium, dorsal half of labrum, gena, basal portion of antennal segment 1, pale; dorsal half of postclypeus dark metallic blue, anteclypeus black with obscure medial pale spot. Occipital tubercles present but small.

Prothorax entirely dark with even dusting of pruinosity, more heavily so on pleural areas, procoxae, and posterior lobe; synthorax dark covered with blue gray pruinosity, more heavily so with a whiter pruinosity on ventral area of thorax, most of metepisternum, all of metepimeron, and venter of thorax. Legs and armature black with light dusting of pruinosity along inferior margins of femora. Wings hyaline; venation black with dusting of white pruinosity along basal veins; pterostigma present, in FW larger than in HW but both surmounting two crossveins; wing tips hyaline; two rows of cells behind CuA in FW and HW, CuA descending posterodistally from tip of CuP and largely paralleling MP, this area enclosing one row of cells.

Anx: FW: 19/18; HW: 18/19.

Abdomen entirely black with slight metallic luster and slight dusting of pruinosity ventrally; a small middorsal spine surpassing posterior margin of segment 10. Genital ligula with distal segment (Fig. 46; paratype) lacking apical lobes, with distal margin nonciliate and emarginate.

Abdominal appendages (Fig. 20a, b) black. Cercus arcuate, medial lobe occupying medial 0.28 of cercus, bluntly triangular; distal fossa occupying distal 0.35, in mediadorsal view transverse and superior ridges meeting at a rounded 90° angle; anterior portion of superior ridge small, isolated from distal fossa. Paraproct with basomesal process small, small tuft of hairs at tip; distal process about 0.45 length of cercus, ending in a blunt point armed with three small medially directed teeth.

HW 25 mm, abdomen 31 mm.

Allotype Female. Head as in male but epicranium with slight metallic luster and with exterior surface of first antennal segment entirely pale, rear of head black, occipital tubercles as in male.

Prothorax dull black with slight metallic luster and with hint of pruinosity; intersternite (Fig. 91a) black, linear, with anterior shoulder, its anterior margin slightly deflected from membrane; synthorax dull black with slight metallic luster and with hint of pruinosity, entirely covered with white hairs; narrow pale thoracic stripes as follows: vestige of humeral stripe along mesinfraepisternum and approximate 0.1 of first lateral suture below base of FW, spot at base of mesepimeron connecting posteriorly to line covering 0.8 of second lateral suture, thicker line along most of third lateral suture and posterior margin of metepimeron; venter of thorax pale with dusting of pruinosity, black around sutures and carinae and with medial black spot near posterior margin; ventral margin of thorax dusted with pruinosity. Coxae pale with exterior surfaces smudged with irregular patches of dull metallic lus-

ter; remainder of legs and armature black with dusting of pruinosity on interior surface of tibiae. Wings as for male, but pterostigmata ivory and with descending CuA not as perpendicular, resulting HW undulation slight; one row of cells between MP and CuA; two rows of cells behind CuA and wing margin.

Anx: FW: 24/27; HW: 27/27.

Abdomen dull black with metallic luster, pale incomplete annuli on abdominal segments 2–7, these becoming progressively smaller and limited to lateral margins; dorsum of segments 8 and 9 evenly convex without a trace of middorsal carina, tip of segment 10 with middorsal spine surpassing end of segment followed by a smaller supplementary dorsolateral spine; ventrolateral margin of segment with a cluster of three to four spines; cercus black.

HW 26 mm, abdomen 29 mm.

Paratypes. Measurements: male, HW 27–29 mm, abdomen 35–38 mm, anx FW 16–21, HW 17–22; female, HW 25–29 mm, abdomen 26–33 mm, anx FW 19–22, HW 17–21.

ETYMOLOGY. Named for my friend and diligent worker on the Neotropical Zygoptera, Frederico A. A. Lencioni, who collected the holotype, allotype, and several paratypes.

DIAGNOSIS. Appendage morphology in males of *Mnesarete lencionii* does not differ significantly from that of *M. pruinosa*; the intraspecific variability within both species matches differences I've observed between each species. The presence of the pterostigma is the only sure way of distinguishing between males. Although the wing base possesses a small amount of milky white spotting in *M. lencionii* (reduced to almost none in holotype and paratype males from Luíz Antonio), these markings are generally more definite and more extensive in *M. pruinosa*. However, considerable overlap exists, and this character cannot be used as a sole criterion for separation.

Females differ from all other species (except *M. borchgravi*, easily separated by characters as given in the key) by the presence of pale pterostigmata. The intersternite (Fig. 91) resembles that of *M. pruinosa* (Fig. 95) but is black, not largely pale as in the latter species, and is narrower and with a less-developed anterior shoulder than in *M. pruinosa*.

DISTRIBUTION (Fig. 157). Known thus far from the type locality (São Paulo State) south through S Paraguay (San Pedro Prov., Arroyo Aguarray-mi, N of Lima, 23°54'S 59°20'W), and central Misiones Prov., Argentina (route 1 km 68.5, north of Azara, 28°3'S 55°42'W) from elevations ranging from 93 meters (north of Azara) to 591 meters (type locality). This species will probably be found in intervening areas in SE Brazil, Paraguay, and Misiones Prov., Argentina.

REMARKS. Paratype males from Argentina have reduced occipital tubercles, slight milky white markings at wing bases (primarily on second series of antenodals past level of quadrangle in HW), and

no middorsal spine on the posterior margin of abdominal segment 10. These males also appear to be younger, as evidenced by greater metallic green luster and reduction of pruinosity on the thorax. One of four paratype males from Azara has a normal-sized pterostigma on the left FW, a hint of a pterostigma on right FW, a small pterostigma on left HW, and no pterostigma on right HW. The two paratype females from Misiones Prov., Argentina, are larger (HW 27–29 mm, abdomen 31–33 mm versus HW 25–27 mm, abdomen 29–29 mm for Brazilian paratypes) and juvenile. Dark parts of the body are metallic cupreous and green, wing venation (except costa) is orange, and basal 0.25 of wings is infused with orange; these differences are likely ontogenetic and are probably representative of younger specimens.

When I first examined specimens of this species from Paraguay and Argentina, I believed, due to the close resemblance in male appendage morphology, that they represented pterostigmatous populations of the well-known *M. pruinosa*. Populations of ptero- and apterostigmatous individuals are known for some species of *Hetaerina* (Garrison, 1990), and I thought the same could be the case here. The two females from Misiones Prov. are juvenile and, though collected with three mature males, at first led me to believe that they were not conspecific. The recent capture of a series of both sexes of *M. lencionii* from Brazil, and the distinctness of the intersternite (Fig. 91), show that they all represent a species different from *M. pruinosa* (Fig. 95).

BIOLOGY. Nothing recorded.

HOLOTYPE. ♂, BRAZIL: São Paulo State, Córrego Vassununga—Luiz Antonio, 591 meters, 21°38'15"S 47°40'41"W, 16 June 2001, (Frederico Lencioni), (FLC).

ALLOTYPE. ♀, same data as holotype.

PARATYPES. 10♂, 8♀, BRAZIL: São Paulo State, same data as holotype but 2♂, 6♀; ARGENTINA: Misiones Prov., route 1 km 68.5, north of Azara, 18 Nov. 1973, (Oliver S. Flint, Jr.), 3♂, 2♀ (RWG, USNM); PARAGUAY: San Pedro Prov., Arroyo Aguaray-mi, N of Lima, 1 Dec. 1973, (Oliver S. Flint, Jr.), 4♂ (RWG, USNM).

Mnesarete loutoni new species

Figs. 21 (app), 92 (int), 115 (wi), 155 (mp)

Mnesarete n. sp. A: Louton *et al.*, 1996:437 (Pak-itzta)

DESCRIPTION. **Holotype Male.** Head entirely matte black; base of mandible, labium, labrum, gena, and clypeus black with blue luster especially on dorsal portion of postclypeus. Occipital tubercles present but small.

Prothorax entirely matte black with dusting of pruinosity along ventral pleural margin; synthorax black with slight metallic violaceous reflections, with narrow pale stripes along second and third lateral sutures, pale line on third suture extending posteriorly below subalar carina and along postero-

ventral margin of metepimeron, obscure pale spots at base of mesepimeron and posteroventral margin of mesinfraepisternum; venter of thorax black, with tuft of hair on posterior half; entire ventral part of thorax dusted with white pruinosity. Legs and armature black. A light dusting of pruinosity along base of legs. Wings hyaline with opalescent reflections; venation black; pterostigma lacking; FW tip hyaline, an obscure brown apical spot on HW, venation within this spot pale red; three rows of cells behind CuA in FW, two in HW; CuA descending almost perpendicularly from tip of CuP and diverging widely from MP this area enclosing two rows of cells at base, and in HW causing wing margin to undulate posterodistally (Fig. 115a; paratype).

Anx: FW: 28/27; HW: 26/27.

Abdomen black with slight metallic luster; segment 1 with small pale spot laterally near annulus; transverse row of hairs along anterior margin of abdominal sternite 1 a thick brush of hairs anterior to anterior hamules; mediodorsal margin of abdominal segments 8 and 9 angularly concave, a middorsal blunt spine surpassing posterior margin of segment 10. Genital ligula with distal segment lacking apical lobes, with distal margin ciliate and emarginate.

Abdominal appendages (Fig. 21; paratype) black. Cercus robust, arcuate, with a tuft of thick, coarse hairs at mediobasal margin; medial lobe small, triangular, and barely surpassing medial margin of cercus; distal fossa small, occupying distal 0.4 of cercus, largely hidden by superior ridge; in mediodorsal view transverse and superior ridges meeting at an acute, rounded angle; medial area between basal tuft of hairs and edge of distal fossa strongly concave; cercus in lateral view linear, strongly swollen ventrally at distal 0.4; paraproct with basomesal process small, practically nonexistent, small tuft of hairs at tip; distal process about 0.25 length of cercus, ending in a blunt point armed with two small, medially directed teeth.

HW 27 mm, abdomen 34 mm.

Allotype Female. Head as in male but with following areas pale: first antennal segment, large spot on each side of labium, base of mandible, base of labrum. Rear of head black, occipital tubercles as in male.

Prothorax as in male; intersternite (Fig. 92; paratypes) approximately linear, with anterior margin slightly swollen; synthorax as in male, but with narrow, pale humeral stripe and corresponding obscure white spots at base of mesinfraepisternum and mesepimeron larger. Metasternum lacking tuft of hairs, a pair of pale spots followed posteriorly by a broad, transverse pale spot at center; metasternum and ventral margin of thorax dusted with pruinosity. Coxae dark brown; remainder of legs and armature black. Wings as for male, but with wing tips hyaline and with descending CuA not as perpendicular, resulting in slight HW undulation; one row of cells between MP and CuA; two rows of cells behind CuA and wing margin.

Anx: FW: 24/27; HW: 27/27.

Abdomen as in male, but with lateral margin of segment 1 obscurely pale with a darker medial spot within; segment 2 similarly pale but with black streak along posterior 0.3–0.8 of segment, annulus black; dorsum of segments 8 and 9 evenly convex without trace of middorsal carina, tip of segment 10 with small middorsal spine surpassing end of segment; ventrolateral margin of segment with a cluster of three spines; cercus black.

HW 26 mm, abdomen 30 mm.

Paratypes. Measurements: male, HW 24.5–28 mm, abdomen 32–37 mm, anx FW 23–28, HW 23–28; female, HW 27–29 mm, abdomen 30–32 mm, anx FW 24–29, HW 24–28.

ETYMOLOGY. Named for my friend, Jerry Louton, who collected the holotype, allotype, and many of the paratypes.

DIAGNOSIS. Males of *Mnesarete loutoni* are easily distinguished from all other species by the unique undulate basal HW margin (Fig. 115a) and shape of the cercus (Fig. 21).

Females are less easily differentiated. The undulate HW margin simulates that of the male (Fig. 115b, c) but is less apparent and in some specimens is barely noticeable. In mature females the dark metallic violaceous body coloration separates it from all other cupreous species. Teneral and juvenile females have an overall cupreous coloration as in *M. devillei*, *M. aenea*, etc. However, the dorsal margin of the postclypeus in juvenile *M. loutoni* is metallic blue, not cupreous as in all other known cupreous species.

DISTRIBUTION (Fig. 155). Thus far known only from Pakitza in Madre de Dios State, Peru, and São Paulo de Olivença, Amazonas State, Brazil. Further collecting will undoubtedly expand the known distribution for this species.

REMARKS. Teneral males exhibit greater violaceous luster on pro- and synthorax, a faint, partial hairline may be present along part of the humeral suture, HW tip markings are present but less visible than in mature males. The type series is remarkably uniform.

BIOLOGY. At Pakitza, *Mnesarete loutoni* occurs with *M. devillei* on small streams where males of both species perch on vegetation at stream's edge. Like other members of this genus, they perch facing the stream. Other species of Odonata sympatric with *M. loutoni*, and detailed information on the type locality, are given in Louton *et al.* (1996).

HOLOTYPE. ♂, PERU: Dept. Madre de Dios, Pakitza, small Quebrada near forest Zone 1 29 Sept. 1987, (J. Louton JAL87-002). Held in trust at National Museum of Natural History, Washington, D.C., pending repatriation per agreement with the Ministerio de Agricultura, Instituto Nacional de Recursos Naturales, Peru.

ALLOTYPE. ♀, PERU: Dept. Madre de Dios, P.N. Manu, Pakitza, Trocha Uno to Aguahal forest (5 km E), 12°07'S 70°58'W, 20 Sept. 1988, (J. Louton JAL88-015). Held in trust at National Museum

of Natural History, Washington, D.C., pending repatriation per agreement with the Ministerio de Agricultura, Instituto Nacional de Recursos Naturales, Peru.

PARATYPES. 60♂, 25♀, BRAZIL: Amazonas, São Paulo de Olivença, Alto Rio Solimões, Jan. 1932, (F. Wucherpfennig), 1♂ (UMMZ); same data but Feb. 1932, 1♂, 1♀ (RWG, UMMZ); PERU: same data as holotype except 3♂, 2♀; same data but 6 Oct. 1987, (J. Louton JAL87-005), 2♂; same data but 12 Oct. 1987, (J. Louton JAL87-006), 2♂, 2♀; approx. 3 km E of Pakitza, "Aguahal," 19 Oct. 1987, (J. Louton JAL87-008), 1♀ (RWG); same data as holotype but 21 Oct. 1987, (J. Louton JAL87-010), 1♀; Manu, Pakitza, trail 2, 250 meters, 12°7'S 70°58'W, 17 Sept. 1988, (O.S. Flint, Jr.), 4♂, 1♀ (USNM); same data but 20 Sept. 1988, 2♂; same data but not "trail 2," (N.E. Adams), 3♂; same data but Trocha Uno to Aguahal forest (5 km E), (J. Louton JAL88-015), 1♂; same data but trail 1, 21 Sept. 1988, (O.S. Flint, Jr.), 6♂; same data but bamboo thicket 4.3 trail km E, 22 Sept. 1988, (J. Louton and N. Adams JAL88-019), 1♂, 1♀; same data but trail 2, 23 Sept. 1988, (N.E. Adams), 1♂; Reserved Zone, Parque Nacional del Manu, T2 S19, 11°56'S 71°18'W, 8 Sept. 1989, (J. Louton JAL89-009), 2♀ (RWG); same data but stream at T2 S14–15, 9 Sept. 1989, (J. Louton JAL89-010), 2♂, 1♀; same data but Trail 1, marker 33 (2nd stream), (Nancy E. Adams), 4♂, 1♀; same data but Trail 2, marker 50, 10 Sept. 1989, (Nancy E. Adams), 1♂; same data but Trail 2, marker 15 (1st stream), 3♀; same data but T2 base camp to S85, (J. Louton JAL89-012), 2♂, 1♀ (teneral); same data but T1 Zone 2 to base camp, 11 Sept. 1989, (J. Louton JAL89-013), 1♀; same data but T2 base camp to S11–12, 12 Sept. 1989, (J. Louton JAL89-014), 1♂, 1♀; same data but Trail 2, marker 18, seeps, 12 Sept. 1989, (Nancy E. Adams), 5♂, 1♀; same data but 16 Sept. 1989, (Nancy E. Adams), 3♂; same data but Trail 2, marker 15 (1st stream), 16 Sept. 1989, (Nancy E. Adams), 5♂, 3♀ (1♀ juvenile); same data but T2 to R2 to T1 to base camp, 17 Sept. 1989, (J. Louton JAL89-019), 2♂; same data but T2 to R2 to T1, 18 Sept. 1989, (J. Louton JAL89-020), 1♂; same data but no specific location, 19 Sept. 1989, (Jon Gelhaus), 2♂; same data but Trail 2, marker 21, 19 Sept. 1989, (Robert Robbins), 1♂; same data but Trail 2, marker 53, 20 Sept. 1989, (Robert Robbins), 1♂; same data but Radial IV, marker 5, 22 Sept. 1989, (Jon Gelhaus), 1♂ (teneral); same data but Trail 2, marker 20, 22 Sept. 1989, (Robert Robbins), 1♀; same data but Trail 2, Plot 1 seepage, 23 Sept. 1989, (Jon Gelhaus), 1♂, 1♀ (♀ juvenile); same data but Troncal Castañal between 36 and 37 on route to palm swamp, 6 July 1995, (R. Garrison), 1♂.

Mnesarete machadoi new species

Figs. 22 (app), 93 (int), 157 (mp)

Lais smaragdina—Longfield, 1929:134 (Burity, Mato Grosso; misidentification)

DESCRIPTION. Holotype Male. Head mostly entirely matte black with green metallic reflections on epicranium, a light uniform dusting of gray pruinosity covering all of head, less so on epicranium; base of mandible, lateral and basal portions of labium, dorsal half of labrum and gena, pale; dorsal half of postclypeus dark metallic green, anteclypeus black with well defined U-shaped medial pale spot. Occipital tubercles present but small.

Prothorax entirely dark with light dusting of pruinosity; synthorax with mesipisternum, mesepimeron, and most of metepisternum dark, lightly covered with blue gray pruinosity, venter of thorax largely pale, smudged with irregular patterns of dark gray; metepimeron dark gray bordered along margin with pale tan line; venter of thorax pale with dark gray along sutures, with a pair of small medial geminate spots and a larger inverted U-shaped medial pale spot near posterior border. Legs and armature black. Wings hyaline; venation black, pterostigma absent, one row of cells behind CuA in FW and HW, CuA descending posterodistally from tip of CuP and largely paralleling MP, this area enclosing one row of cells.

Anx: FW: 16/17; HW: 16/17.

Abdomen dull black with metallic luster, pale incomplete annuli on abdominal segments 2–5, these becoming progressively smaller and limited to lateral margins; dorsum of segments 8 and 9 evenly convex without a trace of middorsal carina, tip of segment 10 transverse without middorsal spine. Genital ligula with distal segment lacking apical lobes, with distal margin nonciliate and emarginate.

Abdominal appendages (Fig. 22) black. Cercus arcuate, medial lobe occupying medial 0.36 of cercus, broadly convex; distal fossa occupying distal 0.30 of cercus, in mediodorsal view transverse and superior ridges meeting at a rounded 60° angle; anterior portion of transverse ridge present, touching distal fossa; paraproct with basomesal process small, small tuft of hairs at tip; distal process about 0.54 length of cercus, ending in a blunt point armed with three small, medially directed teeth.

HW 24 mm, abdomen 33 mm.

Female. Unknown. See "Remarks."dp

Paratypes. Measurements: male, HW 22–25 mm, abdomen 31–34 mm, anx FW 15–19, HW 15–29.

ETYMOLOGY. Named for Dr. Angelo Barbosa Monteiro Machado, my friend and worker on the Brazilian Odonata who has helped me in the form of advice and specimens for over 20 years.

DIAGNOSIS. Males of this species are characterized by the broadly convex medial lobe (Fig. 22) and overall gray pruinose coloration. Differentiation from *M. hyalina* is discussed under that species. Males of *M. machadoi* are easily separated from *M. lencionii* by the lack of pterostigmata, broadly convex medial lobe (bluntly triangular in *M. lencionii*), and complete superior ridge (isolated in *M. lencionii*; Fig. 20). Differences in appendage morphology between *M. machadoi* and *M. prui-*

nosa mirror those between *M. lencionii* and *M. pruinosa*.

DISTRIBUTION (Fig. 157). Known from the type locality (Goiás State, Rio Formoso [Lago das Capivaras]), Parque Nacional de Emas, 860 m, 18°21'48"S 52°34'30"W, NW to W-central (Utiariti, Rio Papagaio, 13°2'S 58°17'W) and SW Mato Grosso State (Reserva do Cabaçal, Reserva do Cabaçal, Rio do Peixe, 229 m, 15°7'48"S 58°22'12"W) from elevations ranging from 860 meters (type locality) to 229 meters. The distribution of this species, which overlaps that of *M. fuscibasis*, will probably be found in intervening areas in SE Brazil.

REMARKS. Some paratype males from Capão do Glória and Lago das Capivaras, Parque Nacional de Emas, have varying extent of pale markings on thorax and abdomen; a few have increased amounts of blue gray pruinosity on the thorax and anterior portion of epicranium. One male from the type locality is a partially crushed juvenile; the dark areas on the head and thorax are dark charcoal gray with a metallic luster, the base of antennal segment 1 is pale, and wing venation is brown. Other males have brown appendages.

The two series from Mato Grosso State differ from the type locality series in a few details. The specimens from Utiariti consist of five males and possibly four females (see below), all of which are smaller (HW 22–23 mm versus 24–25 mm for males from Parque Nacional de Emas) and appear juvenile or teneral. The males differ from Parque Nacional de Emas males in having more pronounced occipital tubercles, orange basal wing venation on veins R + M, and in one male a hint of red HW tips. Two other males from Reserva do Cabaçal are fully mature and match those from Utiariti. These two males have more pronounced pruinosity over the anterior portion of the pterothorax, but they lack pale lines on the posterior portion of the thorax, do not have any red on basal wing venation, and have a small but well-defined HW apical red spot. However, the appendages (Fig. 22) are identical to those from the type locality, and I believe they belong to the same species.

Included with the small series of males from Utiariti were two distinct, but similar species of females. Five of these females, I suspect, represent the female sex of *M. machadoi* as they are of the same size; I illustrate the intersternite (Fig. 93). They are similar to supposed females of *Hetaerina simplex* (Garrison, 1990). The other species is included in a series consisting of one incomplete male (last four abdominal segments lacking) and three females most likely conspecific with this male. The juvenile male has thoracic markings and coloration coincident with *Hetaerina*, but I am unable to identify it to species. These three females are larger (HW = 26–27 versus 21–23 mm for the five smaller females), and have different thoracic markings. The intersternites of the five supposed *M. machadoi* are largely pale, those of the other three larger females

are entirely dark. Without more study material, it is not possible to associate with certainty any of the females with *M. machadoi*.

My reasons for rejecting the possibility that this species might represent *M. hyalina* are discussed under that species.

Longfield (1929:134) lists *Lais smaragdina* from Burity, Chapada, based on three males. Since the Mato Grosso locality is well outside the known range of this Amazonian species. I suspected that they were misidentified and asked Stephen Brooks of the BMNH to reexamine these specimens based on my illustrations and keys. Kelly Jackson kindly replied (personal communication 15 Jan. 2003): "Firstly, there are only 2 males, the third's whereabouts is unknown although there is a pinhole and the space for it. On using your key, it appears that they are *M. machadoi*, not *M. smaragdina*." Upon further inquiry, Jackson reported that one of these males has red on the hind wing tip, characteristic of phenotypes from Utiariti and Reserva do Cabaçal, while the other is typical of the phenotype from Rio Formoso.

BIOLOGY. Nothing recorded.

HOLOTYPE. ♂, BRAZIL: Goiás State, Rio Formoso Lago das Capivaras, Parque Nacional de Emas, 860 meters, 18°21'48"S 52°34'30"W, 14 June 1982, (Newton Dias dos Santos, Luis Fernando Netto, Dácio), (MNRJ).

PARATYPES. 17♂, BRAZIL: Goiás State, same data as holotype, 4♂ (MNRJ, RWG); Rio Formoso, Parque Nacional de Emas, 860 meters, 18°21'48"S 52°34'30"W, 13 June 1982, (N. Dos Santos, L.F. Netto, Dácio), 5♂ (MNRJ, RWG); Fazenda Olho d'Água, Parque Nacional de Emas, 15 June 1982, (N. Dos Santos, L.F. Netto, Dácio), 1♂; Mato Grosso State, Utiariti, Rio Papagaio, 399 meters, 31°2'S 58°17'W, (Karol Lenko), 5♂ (ABMM, RWG); Reserva do Cabaçal, Rio do Peixe, 15°7'48"S 58°22'12"W, (L.O.I. de Souza, J.M. Costa), 2♂ (MNRJ, RWG).

Mnesarete marginata (Selys)

Figs. 23 (app)

Lais marginata Selys, 1879:366 (20 separate, description of male from "Pérou occidental [sic]. Un male unique, communiqué par M. MacLachlan")

Mnesarete marginata: Davies and Tobin, 1984:13

DIAGNOSIS. The appendages of the only known male (Fig. 22) show a remote similarity to those of *Mnesarete ephippium* (Fig. 12) in possessing a well-developed basal lobe. As stated in the key, the basal lobe in *M. marginata* does not exceed the mesal margin of the medial lobe, while the same structure in *M. ephippium* greatly exceeds the mesal margin of the medial lobe. The tip of the paraproct in *M. marginata* forms a slightly dorsoventrally flattened club armed with one recurved tooth; the tip of the paraproct in *M. ephippium* is diagonally spatulate dorsoventrally.

Female. Unknown.

TYPES. I examined and illustrate the holotype male (Fig. 22) labeled "Lais/marginata ♂ Selys" and "E. Perou" in the BMNH. Selys (1879) records the type from "Pérou occidental. Un male unique, communiqué par M. MacLachlan." This he later (1880) corrected to "Pérou Oriental." Kimmins (1969) does not list this species in his type catalog.

DISTRIBUTION. Known only from the imprecise locality of "eastern Peru."

REMARKS. None.

BIOLOGY. Nothing recorded.

MATERIAL EXAMINED. Holotype male only.

Mnesarete mariana Machado

Figs. 17 (app), 158 (mp)

Mnesarete mariana Machado, 1996:621–624, figs. 1, 2 (description of 3♂ from Bahia State, Brazil)

DIAGNOSIS. The status of this taxon, known from six males, is discussed under *Mnesarete guttifera*.

TYPES. Holotype male: Brazil, Bahia State, Chapada Diamantina, Capão, Palmeiras, in ABMM. I illustrate the appendages of a topotype male (Fig. 17) kindly given to me by Dr. A.B.M. Machado.

DISTRIBUTION. Thus far known from Bahia State, Brazil.

REMARKS. See under *Mnesarete guttifera*.

BIOLOGY. Nothing recorded.

MATERIAL EXAMINED. BRAZIL: Bahia State, Chapada Diamantina, Capão, Palmeiras, 1200 meters, 1200 meters, 13°34'S, 41°38'W, 21 Apr. 1995, (Angelo B.M., Paulo A.R., & Eduardo R. Machado), 1♂, (RWG).

Mnesarete metallica (Selys)

Figs. 24 (app), 55, 62, 72 (pth), 94 (int), 105 (ab), 155 (mp)

Lais metallica Selys, 1869:654–655 (10–11 separate, description of at least a pair "Probablement de Bahia ou de la Guiane"); McLachlan, 1881: 27 (additional material and comments on type locality)

Mnesarete metallica—Davies and Tobin, 1984:13
Mnesarete bincksi Fraser, 1946:26–28, fig. 2 (description of 1♂ from Umría, Colombia)

DIAGNOSIS. The appendages of this species are unique (Fig. 24), allowing for easy separation from any other species. Distinctive characteristics include a unique apical lobe that completely hides the distal fossa in mediodorsal view; shortened, spatulate paraproct; and hairy condition of the venter of abdominal segments 7 and 8 (Fig. 105).

Despite the unique condition of the male appendages, the small series of females ($n = 6$) that I believe represent *M. metallica* are similar to several other metallic red females. I have found only one character, an angulate process on the lateral margin of the posterior lobe of the prothorax (Figs. 55, 62b, c, 72b) to be diagnostic. The angulate process

is subject to variation (Figs. 62b, c, 72a, b), but is always present to some degree. Further comments about the separation of females of this species are found under the species accounts of *M. cupraea*, *M. devillei* (with which it is sympatric), *M. ephippium*, and *M. hauxwelli*.

TYPES. Not examined but described from a juvenile pair “Probably from Bahia or from Guiana” presumably in IRSNB or lost. B.E. Montgomery, who studied material of this genus from European museums (Montgomery, 1969), mentioned in his notes that he examined a pair in the IRSNB from Río Bobonaza, Ecuador, as well as two males and a female in the BMNH (ex collection McLachlan) with the note: “from same series as Brussels specimens.” These are the four males and one female listed by McLachlan (1881) of *Lais metallica* from Río Bobonaza. Montgomery also mentioned that he examined the holotype of *M. hincksi*, stating that “[Description]. applies perfectly to *Lais metallica*. Comparison of specimens proves them to be same species”; this decision was later confirmed by De Marmels (1989).

DISTRIBUTION (Fig. 155). *Mnesarete metallica* occurs from the foothills of central Ecuador (Pastaza Dept., Tarqui, S of Puyo, 1472 meters, 1°32'S 78°0'W); northeast through S Colombia (Putumayo Dept., Umbria, in the valley of the Upper Putumayo River, 533 meters, 0°52'N 76°33'W, [type locality of *M. hincksi*]), east through S Venezuela (Amazonas State, Raudal de los Diestos, 140 meters, 2°16'48"N 60°20'24"W, [De Marmels, 1989]). Elevational data range from 140 meters (Raudal de los Diestos) to 1472 meters (Tarqui). This species has been collected with *M. devillei* and is also sympatric with *M. drepane*, *M. ephippium*, and *M. fulgida*.

REMARKS. None.

BIOLOGY. Nothing recorded.

MATERIAL EXAMINED. ECUADOR: Napo Prov., Reserva Etnica Waorami, 1 km S Onkone Gare Camp, 220 meters, 0°38'S 76°36'W, 10 Jan. 1994, (T.L. Erwin [Transect Ent. Fogged]), 2♂ (RWG); stream 8.5 km E of Loreto, 300 meters, 8 Nov. 1997, (K.J. Tennessen), 1♀ (RWG); Jatun Yacu, Río Napo watershed, 700 meters, 1°1'S 77°50'W, 25 Feb. 1937, (Wm. Clarke-Macintyre), 1♂; same data but Mar. 1937, 8♂, 1♀ (RWG); same data but no date, 1♂ (RWG); Río Jatun Yacu, Ilupulin Creek, 700 meters, 1°1'S 77°50'W, Jan. 1935, (Wm. Clarke-Macintyre), 5♂ (RWG); Jatun Yacu, 700 meters, 1°1'S 77°50'W, Mar. 1937, (Wm. Clarke-Macintyre), 1♂; same data but 7 Apr. 1935, 1♂; same data but 12 Apr. 1935, 3♂; same data but 18 Apr. 1935, 1♂ (RWG); trail between main road and Bombaini-Yacu, 25 Mar. 1941, (Wm. Clarke-Macintyre), 1♂ (RWG); Pastaza Prov., Río Sandalias, 5 km S of Puyo, 1000 meters, 1°30'6"S 77°57'48"W, 11 Nov. 1997, (T.W. Donnelly), 3♂ (TWD); Tarqui, south of Puyo, 1472 meters, 1°32'S 78°0'W, 23 July 1975, (Andrea Langley), 1♂ (RWG); Sucumbíos Prov., Limoncocha,

269 meters, 0°24'S 76°37', 1 Mar. 1972, (D.L. Pearson), 1♂ (RWG).

Mnesarete pruinosa (Hagen in Selys)

Figs. 25 (app), 73 (pth), 95 (int), 103 (th),
116 (wi), 156 (mp)

Lais pruinosa Hagen in Selys, 1853:28–29 (description of 1♂ and 1♀ from “Brésil”)

Mnesarete pruinosa: Fraser, 1948:65

DIAGNOSIS. *Mnesarete pruinosa* is a dark blue gray species likely to be confused only with *M. hyalina*, *M. machadoi*, and *M. lencionii*. Morphological differences within the caudal appendages are detailed under species accounts of those species. Unique characters for mature males of *M. pruinosa* are usually the presence of a pronounced white pruinosity on the mesepisternum (Fig. 103a) that contrasts with the remainder of the thorax and possession of a milky white area at the wing bases (Fig. 116).

Females resemble those of *M. guttifera*, *M. hyalina*, *M. machadoi*, and *M. lencionii* and are discussed under those species. As stated under *M. hyalina*, I have been unable to separate the series of females I have seen of *M. pruinosa* from the single female of *M. hyalina*.

TYPES. I illustrate the cercus (transposed) of a syntype male in the ZMHU (Fig. 25). Selys (1854: 95) states that “M. Hagen examine cinq males et cinq femelles du Musée de Berlin pris au Brésil par Sellow.”

DISTRIBUTION (Fig. 156). This species is common in SE Brazil (Minas Gerais State, Teófilo Otoni, 382 meters, 17°51'S 41°30'W [MNRJ]); Santa Catarina State, Nova Teutonia, 300 meters, 27°11'S 52°23'W, E Paraguay (Amambay, stream rt. 5, 5 km E of road to Cerro Cora, 253 meters, 25°56'S 55°47'W, and Misiones Prov., Argentina (Dos de Mayo, 521 meters, 27°2'S 54°39'W) and south through Rio Grande do Sul state, Brazil (Pelotas, 3 meters, 31°46'S 52°20'W).

REMARKS. This species shows great variation in size. The largest specimens are from Nova Teutonia Santa Catarina State, Brazil (male HW = 33 mm, female HW = 34 mm), the smallest are from Salto Encantado, Misiones Prov., Argentina (male HW = 26 mm) and Pelotas, Rio Grande de Sul State, Brazil (female HW = 27 mm). The syntype has a slight milky area on the FW distal to quadrangle, and the basal veins in the HW are dusted with white pruinosity. The superior and transverse ridges of the male cerci are variable. I illustrate a male from Pelotas (Fig. 25a) in which the dorsal (upper) end of the transverse ridge is incomplete, and a male from Nova Teutonia (Fig. 25a) showing a further reduction of the transverse ridge. The second male has the disjunct anterior portion of the superior ridge that characterizes this species, but it almost abuts against the remainder of the superior ridge. I consider this difference intraspecific.

BIOLOGY. Nothing recorded.

OTHER MATERIAL EXAMINED. BRAZIL: Rio de Janeiro State, Riacho entre Lageado grande e Tainbas, 922 meters, 29°16'S 50°18'W, 31 Jan. 1982, (Luis Fernando Netto, H. Mesquita), 2♂ (RWG); Rio Grande do Sul State, Pelotas, 3 meters, 31°46'S 52°20'W, 21 Jan. 1961, (J. Lucia Mantovani-Biezanko), 1♀ (RNHL); same data but 20 Oct. 1968, (C.M. Biezanko), 1♂ (RWG); Rio Tainha, 900 meters, 29°16'S 50°18'W, 20 Jan. 1958, (N. Santos), 1♂ (RWG); Santa Catarina State, Nova Teutonia, 300 meters, 27°11'S 52°23'W, 9 Jan. 1939, (Fritz Plaumann), 1♀ (RWG); same data but 11 Jan. 1939, 1♀; same data but 2 Jan. 1941, 1♂; same data but Jan. 1967, 1♂; same data but Apr. 1967, 1♂; same data but 26 Jan. 1968, 1♀; same data but Mar. 1973, 1♀; **PARAGUAY:** Amambay, stream rt. 5, 5 km E of road to Cerro Cora, 253 meters, 25°56'S 55°47'W, 29 Nov. 1973, (O.S. Flint, Jr.), 1♀ (USNM); **ARGENTINA:** Misiones Prov., Dos de Mayo, 521 meters, 27°2'S 54°39'W, Dec. 1982, 2♀ (LNK, RWG); Capióví, 171 meters, 26°56'S 55°4'W, 5 Apr. 1971, (O.S. Flint, Jr.), 3♂ (RWG, USNM); Parque Nacional Iguazú, Arroyo Mbocay, 161 meters, 25°34'S 54°34'W, 12 Jan. 1988, (J. Muzón), 1♂, 4♀ (MLP); same data but 13 Mar. 1991, 1♂; same data but 13 Apr. 1991, 2♂ (RWG); Iguazú, Salto Encantado, Arroyo, 161 meters, 25°34'S 54°34'W, 4 Nov. 1991, (J. Muzón), 1♂ (RWG); Iguazú, 161 meters, 25°34'S 54°34'W, 15 Jan. 1981, (R. Forster), 1♂ (RWG); same data but 12 Dec. 1981, 1♀ (RWG); Las Tunas, 24 Mar. 1954, 1♂ (RWG); Puerto Libertad (formerly Puerto Bemberg), 228 meters, 25°55'S 54°36'W, 12–29 Jan. 1945, (K. Hayward, A. Willink, R. Golbach), 2♂ (BMNH); Puerto Libertad (near Hostería Bemberg), 228 meters, 25°55'S 54°36'W, 24–25 Nov. 1973, (O.S. Flint, Jr.), 1♂ (RWG).

Mnesarete pudica (Hagen in Selys)
Laís pudica Hagen in Selys, 1853:29 (description of at least 3♂ and 1♀ from “Brésil [Ypanema]”)
Mnesarete pudica: Fraser, 1947a:432

DIAGNOSIS. Males of this distinctive species can be recognized by the broad wing ratio (Fig. 117b, c), red-colored wings (Figs. 117a, 133), and distinctive appendage morphology (Fig. 26). As stated under *Mnesarete fuscibasis*, the cerci of these two species appear indistinguishable.
Females are diagnosed under *M. fuscibasis*. The two subspecies of *M. pudica* are discussed below.

**KEY TO SUBSPECIES OF MALES OF
MNESARETE PUDICA**

The character for evaluating the two subspecies will not always work since intergrades (= hybrids [Costa, 1986]) occur in several localities. Although I have seen only a few specimens of both taxa (and no females of *Mnesarete pudica phryne*), I have relied on the character given by Costa for separation of males. According to Costa (1986) “As in so

many other cases of speciation, females show smaller differentiation of characters, [making it] impossible with the data that we analyzed, to define its taxonomic state.”
1 Red on wings extending to or just beyond nodus; S Minas Gerais, Rio de Janeiro, easternmost São Paulo (intermediate specimen), and Goiás (intermediate populations) states in Brazil *M. pudica phryne*
1' Red on wings extending to wing tip in HW, to apical 0.2 of FW (Figs. 117a, 133); São Paulo, Paraná, Rio Grande do Sul, Minas Gerais, and Goiás states in Brazil; S Paraguay; Misiones Prov. in Argentina *M. pudica pudica*

Mnesarete pudica phryne Costa
Mnesarete pudica phryne Costa, 1986:11–15, plate I, figs. 1, 4, 7; plate II, figs. 1–7; plate III, figs. 1, 2; plate IV, figs. 1, 4, 7; plate V, figs. 1–5 (description of 1♂, 1♀ from Brazil, Rio de Janeiro State, Fazenda São Joaquim, Areal [Costa and Mascarenhas, 1998])

DIAGNOSIS. A thorough discussion and illustration of this subspecies is given by Costa (1986).
TYPES. Holotype and allotype in MNRJ (not examined).

DISTRIBUTION (Fig. 150). According to Costa (1986), this subspecies occurs in S Minas Gerais and Rio de Janeiro states; intermediate specimens between this and *Mnesarete pudica pudica* are known from W Rio de Janeiro, E São Paulo, S Goiás, and W Minas Gerais states.

REMARKS. I have examined one topotype male from Rio de Janeiro State (Fazenda São Joaquim, Areal, 22°15'47"S 43°12'37"W, RWG ex MNRJ), and six males from Minas Gerais (S. Lourenço, 22°6'40"S 45°2'50"W, 2♂, RWG ex MNRJ; 9 km E Leopoldina, 4♂, RWG ex USNM). Costa (1986) presents a thorough account of this subspecies, including statistical data on wing length/width ratios.

BIOLOGY. Costa (1986) describes the type locality as a “... nameless stream ... at Fazenda São Joaquim, about 12 km from Areal, [a] small villa close to BR-116 highway and 120 km from Rio de Janeiro. The low gradient coiling stream originates in the hills becomes about 50 cm wide, forming small bays and pools, with a steady current being covered mainly with ‘lirio-do-brejo’ (swamp’s lily) (*Hedychium coronarium* Koen, Zingiberaceae).” Habits of this species are described as “... always landing in perpendicular direction to the stream, the body inclined downward ... [they perched] longer than *Hetaerina* which constantly moved from perch to perch ...” and “... night observations using a flashlight [showed] many specimens perched in marginal vegetation; not light, nor touching them would make them leave their position; they seemed in a lethargic state.” Despite intensive field observations, Costa (1986) observed only one pair in copula. One field-marked specimen lived 37 days.

MATERIAL EXAMINED. BRAZIL: Goiás State, Cachoeira Alta, 400 meters, 18°50'S 50°55'W, 15 Oct. 1982, (N. Dos Santos, Luis F. Netto, Dacio), 2♂ (RWG); Minas Gerais State, S. Lourenço, 867 meters, 22°6'40"S 45°2'50"W, 20 Jan. 1976, (N. Dos Santos, Moysés C. Mendonça), 2♂ (RWG); 9 km east of Leopoldina, 24 Apr. 1977, (C.M. & O.S. Flint, Jr.), 4♂, 1♀ (USNM, RWG); Rio de Janeiro State, Fazenda São Joaquim, Areal, 273 meters, 22°15'47"S 43°12'37"W, 1 May 1979, (N. Dos Santos, Janira M. Costa), 2♂ (RWG).

Mnesarete pudica pudica (Hagen in Selys)

Figs. 26 (app), 40 (ha), 96 (int), 117 (wi),
133 (by), 134 (li), 150 (mp)

Laïs pudica Hagen in Selys, 1853:29 (description of at least 3♂ and 1♀ from "Brésil [Ypanema]" [see below])

Mnesarete pudica: Fraser, 1947a:432

DIAGNOSIS. A thorough discussion and illustration of this subspecies is given by Costa (1986). According to Costa, females of this subspecies cannot be reliably separated from females of *Mnesarete pudica phryne*.

TYPES. Hagen in Selys (1853:29) mentions "Brésil (Ypanema). (Musées de Vienne et de Berlin.)," and in 1854:96 "La province d'Ypanema au Brésil, d'où Musée de Vienne l'a reçue par M. Natterer.—Le Brésil, d'après les exemplaires du Musée de Berlin par M. Sellow." St. Quentin (1970:260) mentions 2 male syntypes in NHMW and I examined one male and female syntype in ZMHU. The male is labeled "Pudica/Hagen/Brasil Sellow" and has abdominal segments 8–10 and appendages replaced by those of a probable *Hetaerina hebe* Selys; the female lacks abdominal segments 4–10. A pair of this species is in the Hagen collection at the MCZ. The male is labeled "Agr. pudicum/Bras [undecipherable]"; the female is labeled "Brazil," "Mus. Berol [printed]." I am unsure if the pair are syntypes though they are listed as types in MCZ.

DISTRIBUTION (Fig. 150). *Mnesarete p. pudica* is known thus far from Chapada dos Guimarães (15°26'S 55°45'W) in S Mato Grosso State through S Goiás State (Itumbiara, 18°25'10"S 49°13'9"W), Minas Gerais State south through Paraná State in Brazil, SE Paraguay, and N Misiones Province, Argentina (Costa, 1986). Costa also lists one record from Rio Grande do Sul (Pelotas, 31°46'S 52°20'W) from elevations of 7 meters (Pelotas) to 1700 meters (Rio de Janeiro, Serra de Bocaina, 22°40'S 44°40'W).

REMARKS. Costa (1986) provided the latest and most complete information on this subspecies, including statistical data on wing length/width ratios as well as information on biology and biogeography. I illustrate the wings of a male with red pigment present (Fig. 116a) and removed (Fig. 116b) in order to more clearly show wing venation.

BIOLOGY. Frederico Lencioni (*in litt.*) states that he collected this subspecies always on slow

creeks in open, sunny areas with a lot of vegetation in the margins; he also took them in flooded areas adjacent to these creeks.

OTHER MATERIAL EXAMINED. BRAZIL: São Paulo State, Fazenda Santa Luzia da Boa Vista, Brotas, 594 meters, 21°13'48"S 48°15'9"W, 22 Jan. 1999, (F.A.A. Lencioni), 1♂ (RWG); São Carlos, 766 meters, 22°1'S 47°54'W, 13 Mar. 1973, 1♂, 1♀ (RWG); same data but 28 Mar. 1973, 2♂ (RWG); ARGENTINA: Misiones Prov., Iguazú, 161 meters, 25°34'S 54°34'W, 9 Nov. 1975, (Jamsic-Willink), 1♂ (RWG); Parque Nacional Iguazú, 161 meters, 25°34'S 54°34'W, 9 Nov. 1975, (Claps-Escobar), 1♂ (RWG); Puerto Libertad (near Hostería Bemberg), 228 meters, 25°55'S 54°36'W, 24–25 Nov. 1973, (O.S. Flint, Jr.), 1♂ (RWG); Misiones Prov., route 1 km 68.5, north of Azara, 18 Nov. 1973, (Oliver S. Flint, Jr.), 2♂ (RWG, USNM).

Mnesarete rhopalon new species

Figs. 27 (app), 157 (mp)

DESCRIPTION. Holotype Male. Head entirely matte black with metallic reflections covered with white pruinosity on postfrons; base of mandible and gena pale; labrum pale, edged with black at distal and basal margins, these areas connected medially, thus separating pale lateral areas; labium largely black, postclypeus dark metallic blue green, anteclypeus black with obscure medial pale spot. Occipital tubercles present but small.

Prothorax entirely dark dull metallic green with heavy dusting of pruinosity on dorsal surface; synthorax dark metallic green covered with white pruinosity on posterior half of metepimeron, metathorax, and venter of thorax, thus obscuring any pale lines along lateral sutures. Legs and armature black. Wings hyaline; venation black; pterostigma absent, wing tips brown, the FW spots smaller; two rows of cells behind CuA in FW and HW, CuA descending posterodistally from tip of CuP and largely paralleling MP, this area enclosing one row of cells.

Anx: FW: 18/17; HW: 17/17.

Abdomen entirely black with slight metallic luster, segment 1 covered with white pruinosity; a slight dusting of pruinosity on anterior 0.5 of segment 2 and less so on ventral areas of succeeding tergites; middorsal carina ending at posterior margin of segment 10. Genital ligula with distal segment lacking apical lobes, with distal margin non-ciliate and emarginate.

Abdominal appendages (Fig. 27) black. Cercus almost linear, medial lobe vestigial; distal fossa small, occupying distal 0.17 of cercus, in mediadorsal view transverse and superior ridges meeting at a rounded 90° angle; anterior portion of superior ridge diagonal, extending to medial part of transverse ridge. Paraproct with basomesal process small but prominent, small tuft of hairs at tip; distal process about 0.38 length of cercus, roundly curved

mediodorsally ending in a well-developed club armed with small foliate plates and blunt spines.

HW 25 mm, abdomen 33 mm.

Female. Unknown.

Paratype. Male. Measurements: HW 25 mm, abdomen 33 mm, anx FW 16, HW 16.

ETYMOLOGY. *rhopalon*—Greek for club, in reference to the clublike paraproct (Fig. 27).

DIAGNOSIS. The unique appendage morphology, especially of the curved clublike paraproct, easily distinguishes this species from all others.

DISTRIBUTION (Fig. 157). Known thus far from two localities in Minas Gerais State, the type (Poços de Caldas) and paratype (São Roque de Minas) localities.

REMARKS. Through the kindness of Dr. Angelo B.M. Machado, I received a young male of this species. The paratype lacks pruinosity and differs from the holotype as follows: labrum pale with small dark medial basal spot, postclypeus dark metallic purple contrasting with dull metallic green of epicranium, occipital tubercles absent, metallic green pterothorax with narrow interrupted pale line on humeral suture, broader lines on third lateral and posterior margin of metepimeron, and brown apical wing spots reduced (probably due to age differences). I can see no significant differences in the caudal appendages.

BIOLOGY. Nothing recorded.

HOLOTYPE. ♂, BRAZIL: Minas Gerais State, Aeroporto, Poços de Caldas, 1403 meters, 21°48'S 46°34'W, 8 Feb. 1964, (N. Dos Santos), (MNRJ).

PARATYPE. 1♂, BRAZIL: Minas Gerais State, São Roque de Minas (Parna Serra da Calastra), 21°48'S 46°34'W, Oct. 2001, (L. Bedé), (RWG).

Mnesarete smaragdina (Selys)

Figs. 28 (app), 97(int), 107 (ab), 153 (mp)

Lais smaragdina Selys, 1869:652–653 (8–9 separate, description of at least 2♂, 1♀ from “Santarem sur l’Amazone (par M. Bates)”)

Mnesarete smaragdina—Davies and Tobin, 1984:13

DIAGNOSIS. *Mnesarete smaragdina* is one of the three small metallic green Amazonian species. Males are differentiated from *M. astrape* under that species account; the appendages closely resemble those of *M. williamsoni* but differ by the shape of the paraproct. In *M. smaragdina*, the paraproct is linear (Fig. 28c) and ends in a characteristic blunt tip armed with two teeth (Fig. 28d); in *M. williamsoni*, the paraproct is smoothly angulate when viewed laterally (Fig. 29c) and terminates in an expanded, dorsoventrally flattened spatulate process in dorsal (Fig. 29a) and mediodorsal view (Fig. 29b).

In spite of differences in the paraprocts of the males I have been unable to find any character with which to separate females of *M. smaragdina* and *M. williamsoni*.

TYPES. In order to clarify application of the name, I designate as LECTOTYPE a male selected

by De Marmels in 1984 (white label: “*Lais smaragdina* Sel./LECTOTYPUS/design DE MARMELS, 1984”). The tips of the cerci are broken (Fig. 28; lectotype) but the small size, metallic green coloration, shape of paraprocts, and comparison with topotypical material convince me that I have correctly associated specimens and name.

DISTRIBUTION (Fig. 153). Like *Mnesarete astrape*, *M. smaragdina* is a lowland Amazonian species thus far known only from E Pará State in Brazil (Santarem, 2°26'S 54°42'W; Vila Braga, 4°25'S 56°17'W). Longfield's (1929:134) report of this species from Mato Grosso are misidentifications of *M. machadoi*, as explained under that species.

REMARKS. None.

BIOLOGY. Nothing recorded.

OTHER MATERIAL EXAMINED. BRAZIL: Pará State, Santarem, 11 meters, 2°26'S 54°42'W, no date, (Jean Belle), 4♂, 2♀ (RWG); Vila Braga, 41 meters, 4°25'S 56°17'W, no date, (Jean Belle), 1♂ (RWG).

Mnesarete williamsoni new species

Figs. 29 (app), 98 (int), 108 (ab), 118 (wi), 154 (mp)

DESCRIPTION. **Holotype Male.** Head entirely brilliant metallic green with blue reflections; mandible, labrum, labium, dorsal half of gena, and antennal segment 1 black; medial half of gena ivory; dorsal half of postclypeus dark metallic blue, anteclypeus black with obscure medial ivory spot. Occipital tubercles present but small.

Prothorax entirely brilliant metallic blue green, pruinose along ventral margin of pleural areas and procoxae; synthorax brilliant metallic blue green with obscure lines of pruinosity on interpleural and third lateral sutures, posterior margin of metepimeron, and more heavily so with white pruinosity on ventrolateral and venter of thorax. Legs and armature black. Wings hyaline; venation black; basal area of FW slightly reticulate with three or four rows of cells; pterostigma absent; FW tip hyaline, HW with well-developed brown apical spot; three rows of cells behind CuA in FW, two in HW, CuA descending posterodistally from tip of CuP and largely paralleling MP, this area with one row of cells except for four or five interspersed double rows near base.

Anx: FW: 28/29; HW: 27/26.

Abdomen metallic blue green with slight dusting of pruinosity on terga 1 and along ventral margins of tergites 2 and 3; prominent middorsal carina on segment 10 with no posterior spine. Genital ligula with distal segment lacking apical lobes, with distal margin nonciliate and emarginate.

Abdominal appendages (Fig. 29) black. Cercus slightly arcuate, medial lobe occupying medial 0.28 of cercus, broadly convex; distal fossa occupying distal 0.32 of cercus in mediodorsal view; transverse and superior ridges meeting at a rounded acute angle; anterior portion of superior ridge

small, isolated from distal fossa; paraproct with basomesal process small, small tuft of hairs at tip; distal process smoothly angulate in lateral view, extending to about 0.42 length of cercus, ending in a swollen, dorsoventrally spatulate process.

HW 25 mm, abdomen 34 mm.

Allotype Female. Head as in male but epicranium brilliant metallic green, postfrons metallic blue, exterior surface of first antennal segment entirely pale; base of mandible, medial portion of gena, basal half of labium ivory; labrum black with large ivory spot separated by medial black; rear of head metallic green, occipital tubercles as in male.

Prothorax metallic green with small pale propleural spot; intersternite (Fig. 98d) black, linear, with anterior shoulder; synthorax metallic green with narrow ivory lines surrounding margins of metepisternum and becoming successively thicker around metepimeron; venter of thorax pale; black around sutures and carinae and with medial black spot near posterior margin; ventral margin of thorax dusted with pruinosity. Coxae dark with pale spot along posterior margins; remainder of legs and armature black. Wings flavescent, venation black; pterostigma absent; wing tips lacking brown spots; two rows of cells behind CuA in FW and HW, CuA descending posterodistally from tip of CuP and largely paralleling MP, this area with one row of cells except for four or five interspersed double rows near base.

Anx: FW: 21/21; HW: 23/21.

Abdomen with metallic green luster, pale incomplete lateral spots at annuli on abdominal segments 1, 3, and 4, these becoming progressively smaller; dorsum of segments 8 and 9 evenly convex without a trace of middorsal carina, tip of segment 10 (Fig. 108; paratype) with middorsal spine surpassing end of segment; supplementary dorsolateral spines absent; ventrolateral margin of segment with a cluster of three or four spines; cercus black.

HW 24 mm, abdomen 26 mm.

Paratypes. Measurements: male, HW 22–25 mm, abdomen 32–34 mm, anx FW 25–30, HW 25–31; female ($n = 5$), HW 23.5–26 mm, abdomen 26–29 mm, anx FW 22–24, HW 22–26.

ETYMOLOGY. Named for Edward Bruce Williamson (1877–1933), renowned collector of Neotropical Odonata whose collections made some 80 years ago are still benefiting students of the order.

DIAGNOSIS. This species is similar to two other Amazonian metallic green species, *Mnesarete astrape* and *M. smaragdina*, and is diagnosed under those species accounts. As stated under *M. smaragdina*, I have been unable to separate females of *M. smaragdina* from *M. williamsoni*. The females included here under *M. williamsoni* were all collected with males and the two species are known thus far to be allopatric.

DISTRIBUTION (Fig. 154). Known from the type locality (Belém, 1°27'S 48°29'W) and up to 60 km northeast (Boa Vista, Apeú, 1°18'S 47°59'W) in NE Pará State. *Mnesarete williamsoni* occurs

690 km east of the closest known locality (Santarem, 2°26'S 54°42'W) for *M. smaragdina*.

REMARKS. Little variation is expressed in the paratype series. The series collected by J.H. Williamson and J.H. Strohm was later identified by E.B. Williamson as *Lais smaragdina* Selys. As explained under *M. smaragdina*, *M. williamsoni* differs by the shape of the paraproct.

BIOLOGY. Nothing recorded.

HOLOTYPE. ♂, BRAZIL: Pará State, Belém, 1°27'S 48°29'W, 7 Aug. 1922, (Jesse H. Williamson and J.W. Strohm), (UMMZ).

ALLOTYPE. ♀, same data as holotype.

PARATYPES. 44♂, 5♀, BRAZIL: Pará State, same data as holotype, 4♂, 2♀ (UMMZ, RWG, USNM, BMNH); same data but 1 Aug. 1922, 10♂, 2♀; same data but 2 Aug. 1922, 2♂ (UMMZ); same data but 5 Aug. 1922, 1♂; same data but 14 Aug. 1922, 1♂; Belém–Brasília km 92, 1°27'S 48°29'W, 7 Aug. 1959, (N. dos Santos), 3♂ (MNRJ, RWG); Belém–Brasília Igarapé Jaboti Maior km 75, 1°27'S 48°29'W, 6 Aug. 1959, (N. dos Santos), 2♂ (MNRJ); Estrada Belém–Brasília km 36, 6 Aug. 1959, (N. dos Santos), 1♂ (MNRJ); Benfica, 1°18'S 48°18'W, 24 June 1958 (Flavio), 10♂ (ABM, IZA, RWG); same data but 6 Mar. 1963, 2♂ (ABM); Boa Vista, Apeú, 1°18'S 47°59'W, 6 Mar. 1963, (P. Waldir), 1♂ (ABM); Guajará: Ananindeua, 1°22'S 48°23'W, 7 Sept. 1963, (Souza, Paulo), 1♂ (ABM); Benevides, Feb. 1957, (A.B.M. Machado), 4♂, 1♀ (ABMM, RWG); Santo Antônio do Tauá, Aug. 1°11'S 48°8'W, 1964 (A.B.M. Machado), 2♂ (ABMM).

DISCUSSION

A phylogenetic analysis of *Bryoplathanon*, *Mnesarete*, *Hetaerina*, and *Ormenophlebia* is a difficult undertaking. The species composing these four genera were first assigned to subfamily Hetaeriniinae by Tillyard and Fraser (1939) and Fraser (1957) and later by Bechly (1996). [Note: Fraser (1957:81) lists Hetaeriniinae following Tillyard and Fraser (1939), but he used Hetaeriniidae in his front piece showing the “Origin and descent of the Order Odonata.”]. The species share the following synapomorphies: arculus straight with its posterior part strongly reduced (convergent in *Vestalis* Selys); sectors of arculus diverging from one point, discoidal cell strongly curved with anterior side convex, red color pattern of wings, MP of both wing pairs with a unique kink shortly distal to discoidal cell, which is apparently correlated with unique curvature of CuA beneath discoidal cell, CuA of forewings basally much more strongly curved than in hind wings, and forewing cubito-anal space more reticulated than in hind wing.

The only other genera of New World Calopterygidae are the north temperate *Calopteryx* and the isolated Guyanan/Venezuelan *Iridictyon*. The latter differs from other South American genera in having broad wings, lacking crossveins in the midbasal

space, and lacking a distal fossa in male cercus; therefore it belongs to a different group within Calopterygidae. De Marmels *et al.* (1996) have cogently argued, based on biogeographic and morphological evidence, that *Iridictyon* is closely related to the African genus *Phaon*. One problem in constructing a phylogenetic tree for the Hetaeriniinae is determining its outgroup; the cercus of almost all of the members of these four genera has a distal fossa, a condition shared only by some (several?) species of the Indian and southeast Asian genus *Vestalis* (see Lieftinck [1965] for illustrations). However, *Vestalis* does not possess crossveins within the midbasal space. Rehn (2003) in his phylogenetic analysis of the Zygoptera included Hetaeriniinae within the Calopterygidae based on morphological evidence. Dumont *et al.* (2005) have recently reconstructed the phylogeny of this family based on ribosomal DNA evidence. Using three species of *Hetaerina* (*H. americana* (Fabricius), *H. medinai* Ráčenis, and *H. titia*) to represent all of the Hetaeriniinae, they considered it the basal sister group to Calopterygidae *sensu stricto* and elevated the subfamily Hetaeriniinae to family status.

I acknowledge that the current definition of the genus *Mnesarete* is unsatisfactory, but I have been unable to discover any unique venational or corporal character(s) that allow a successful discrimination between the 37 currently described species of *Hetaerina* and the 24 species assigned here to *Mnesarete*. The exclusion of the large South American species described under *Mnesarete* (*M. imperatrix*, *M. rollinati*, *M. regina*, *M. saltuum*, and *M. globifer*) has, I believe, helped to more precisely define the genus, but I am not satisfied that the restricted definition of this genus represents a monophyletic unit. Most species within *Hetaerina* and *Mnesarete* are identified only with reference to the caudal appendages of males. The morphology of appendages within *Hetaerina* is remarkably uniform, but great interspecific variability exists among the 24 species of *Mnesarete*. Costa *et al.* (2000:5–6), in their studies on the Odonata of São Paulo State, mention that in “. . . the analyzed species of *Hetaerina*, vein RS [= IR₂] is slightly too widely separated from vein R1 [= RA] whereas in the specimens of *Mnesarete* vein RS is joined at its origin with vein R1. . . .” I have not found this character to be useful in material that I examined.

Some species of *Mnesarete* closely approach species of *Hetaerina* in male appendage morphology. For example, these structures are remarkably similar in the following species pairs: *H. brightwelli* and *M. borchgravii* (strongly robust cercus; Figs. 137, 138), *M. grisea* and *H. charca* (long paraproct with recurved tip, general shape of cercus; Figs. 139, 140), and *H. simplex* and *M. fuscibasis* and *M. pudica* (superior ridge meeting median portion of transverse ridge; Figs. 141–143). However, these species are easily distinguished by other characters (see under respective species accounts of *Mnesarete*). In addition to the differences in wing color, size,

and shape of the caudal appendages in males, morphology of the intersternites differs between two of these three species pairs (Figs. 137–140). While morphology of the female intersternite is the same in *H. simplex*, *M. fuscibasis*, and *M. pudica*, the thoracic pattern (Fig. 100) and relative wing width ratios (Figs. 113c, 117c, 132) easily separate these two species of *Mnesarete* from *H. simplex*. The morphology of the genital ligula in *H. simplex* is unique among all 37 currently described species of *Hetaerina* in possessing a transverse distal margin; all other species possess an emarginate distal margin (as in Figs. 44b, 45b, 46b).

Garrison (1990:179) commented “. . . I have an undescribed species [of *Mnesarete*] whose males are polymorphic as to basal wing spotting.” The specimens in question consist of three males from Colombia (Antioquia Dept., tributary to Quebrada Potreros, west of La Fe, small development at “Fizibad,” SE of Medellín on road to La Ceja, 2000 meters, 6°5'24"N 75°30'34"W, 26 Feb. 1984, [C.M. and O.S. Flint], [USNM, RWG]). One male has red at the wing bases while two others have no trace of red. All have red wing tips and the basal part of the wings is reticulate. Further examination of these males convinces me, especially when comparing the caudal appendages (Fig. 32) with those of *H. aurora* Ris in Garrison (1990, fig. 40) that these specimens represent that species. The two males of *H. aurora* referred to above are the only specimens of any species of *Hetaerina* known to me that lack any basal red on the wings.

Thus, the current definition of *Mnesarete* continues to be problematic, because certain species (*M. fuscibasis*, *M. grisea*, and *M. pudica*) do not easily fit within the current concept of the genus, and certain species of *Hetaerina* (*H. titia* with variable amounts of black markings in addition to basal red on wings, and *H. simplex* with transverse apical margin of genital ligula without rudimentary apical lobes) and some (*H. aurora* with no red on wings) deviate from the current definition of that genus. *Mnesarete* and *Hetaerina* may form a monophyletic group with the more compact cluster of species belonging to *Hetaerina* (similar morphology of male appendages, and basal red on wings of male) forming a subgroup within it. Bechly (1996) considered the abbreviated apical lobes of the genital ligula of *M. pudica* (also present in *M. fuscibasis*) as a plesiomorphic condition for his subfamily Hetaeriniinae (= *Bryoplathanon*, *Hetaerina*, *Mnesarete*, *Ormenophlebia*). *Hetaerina* is still defined only by one apomorphy: some degree of basal red spotting in the wings (also present in the Oriental genus *Archineura* Karsch, possibly a convergence) but no apomorphy for *Mnesarete* is currently known.

A future resolution to the problem may come with a formal analysis of characters, acquisition of more specimens, and the description of the larva of *Bryoplathanon* (Carvalho and Nessimian, 1998) and other species of *Mnesarete*. For practical purposes, I currently include in *Mnesarete* all species

that have areticated midbasal space (shared with *Hetaerina*, *Bryoplatanon*, and *Ormenophlebia*) and whose males lack any red at the base of the wings. One species, *M. pudica* with the basal 0.70 or more of the wing entirely red, is an exception. There appears to be no sure means of differentiating some females of *Mnesarete* from *Hetaerina* as mentioned in the key to genera.

There is the possibility that a biological (= behavioral?) difference may separate *Mnesarete* and *Hetaerina* based on my observations. Despite the fairly uniform appearance of the male appendages of *Hetaerina*, intersternites of females are morphologically different in some closely related, sympatric species pairs (e.g., *H. capitalis* Selys, *H. infecta* Calvert, *H. majuscula* Selys; *H. aurora* Ris and *H. fuscoguttata* Selys; and *H. mendezi* Jurzitza and *H. rosea* Selys; see Garrison [1990] for illustrations). These differences suggest patterns of character displacement and the different morphologies of the intersternites most likely play an important role in allowing males to achieve a successful tandem position. However, as discussed earlier, the female intersternites of most species of sympatric *Mnesarete* do not seem to differ interspecifically. I predict that differences in courtship patterns will eventually be found to exist between most *Hetaerina* and *Mnesarete*, as manifested by the different interspecific patterns of variation of the intersternites between these two genera.

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FIGURE CAPTIONS

Figures 1, 2 Male caudal appendages. 1. *Bryoplatthanon globifer*. 2. *Ormenophlebia imperatrix*: a mediodorsal; b dorsal; c lateral; d paraproct

Figures 3, 4 *Ormenophlebia* spp., male caudal appendages: a mediodorsal; b dorsal; c lateral; d paraproct

Figure 5 *Ormenophlebia saltuum*, male caudal appendages: a mediodorsal; c lateral; d paraproct

Figures 6–29 *Mnesarete* spp., male caudal appendages: a mediodorsal; b dorsal; c lateral; d paraproct

Figures 30, 31 *Iridictyon* spp., male caudal appendages: a mediodorsal; c lateral

Figure 32 *Hetaerina aurora*, male caudal appendages: a mediodorsal

Figure 33 *Bryoplatthanon globifer*: a male, abdominal segments 1 and 2; lateral; b, c female, anterior lamina, lateral; d male, anterior hamules

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Figure 74 *Bryoplatthanon globifer*, left intersternite of fe-

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Figure 90 *Mnesarete hyalina*, left intersternite: a male; b female

Figures 91–98 *Mnesarete* spp., left intersternite of female (right intersternite illustrated and reversed for some specimens where series insufficient)

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Figures 109–120 Wings. 109. *Bryoplatthanon globifer*. 110. *Ormenophlebia saltuum*. 111–118. *Mnesarete* spp. 119, 120. *Iridictyon* spp.

Figures 121–125 Forewing base. 121. *Calopteryx* spp. 122. *Mnesarete* spp. 123. *Hetaerina* spp. 124. *Calopteryx* spp. 125. *Iridictyon* spp.

Figures 126, 127 *Iridictyon* spp., nodal area of forewing

Figures 128–130 Habitus, lateral. 128. *Bryoplatthanon globifer*. 129. *Ormenophlebia imperatrix*. 130. *Mnesarete borchgravi*

Figures 131, 132 *Mnesarete fuscibasis*. 131. Genital ligula: a lateral; b ectal. 132. Habitus, lateral

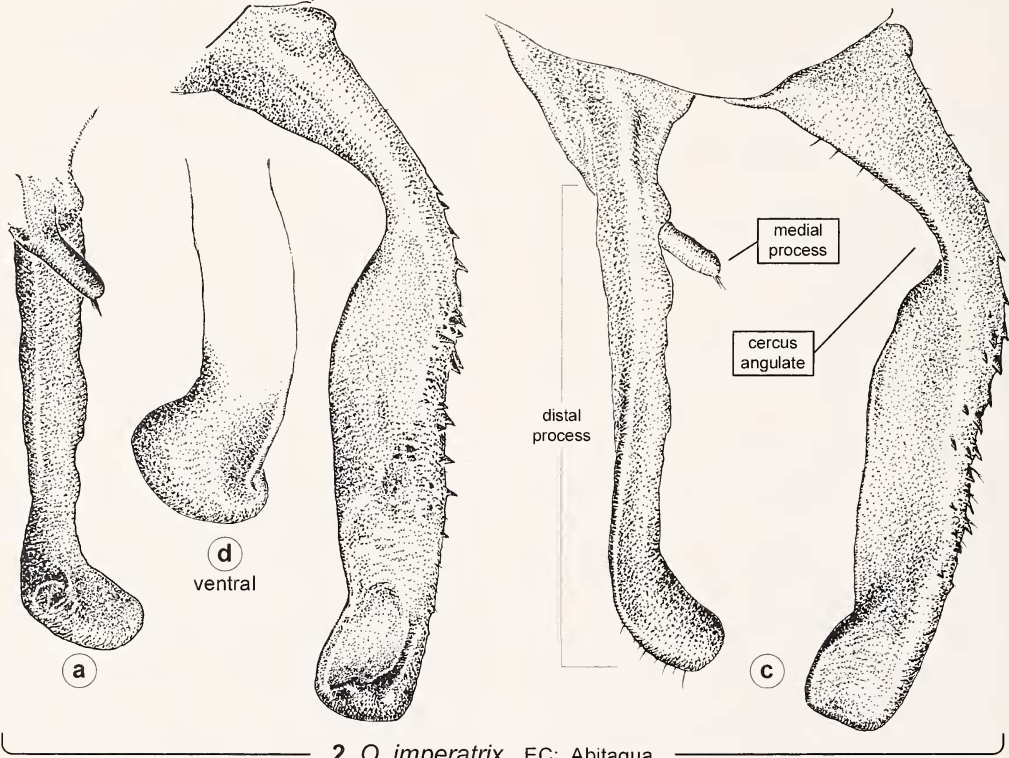
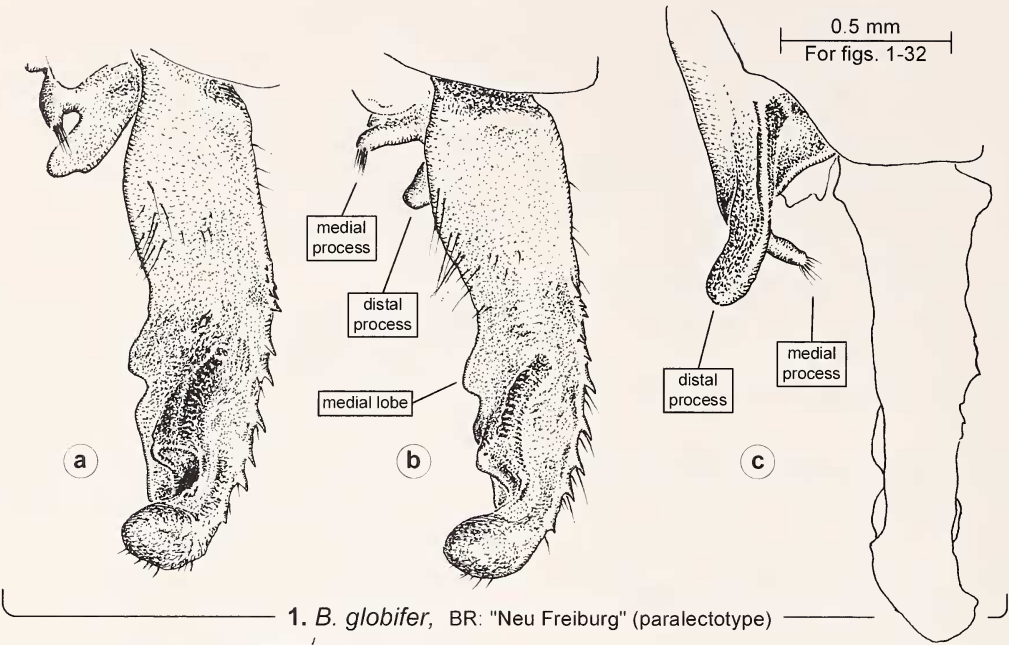
Figures 133, 134 *Mnesarete pudica pudica* 133. Habitus, lateral. 134. Genital ligula: a lateral; b ectal

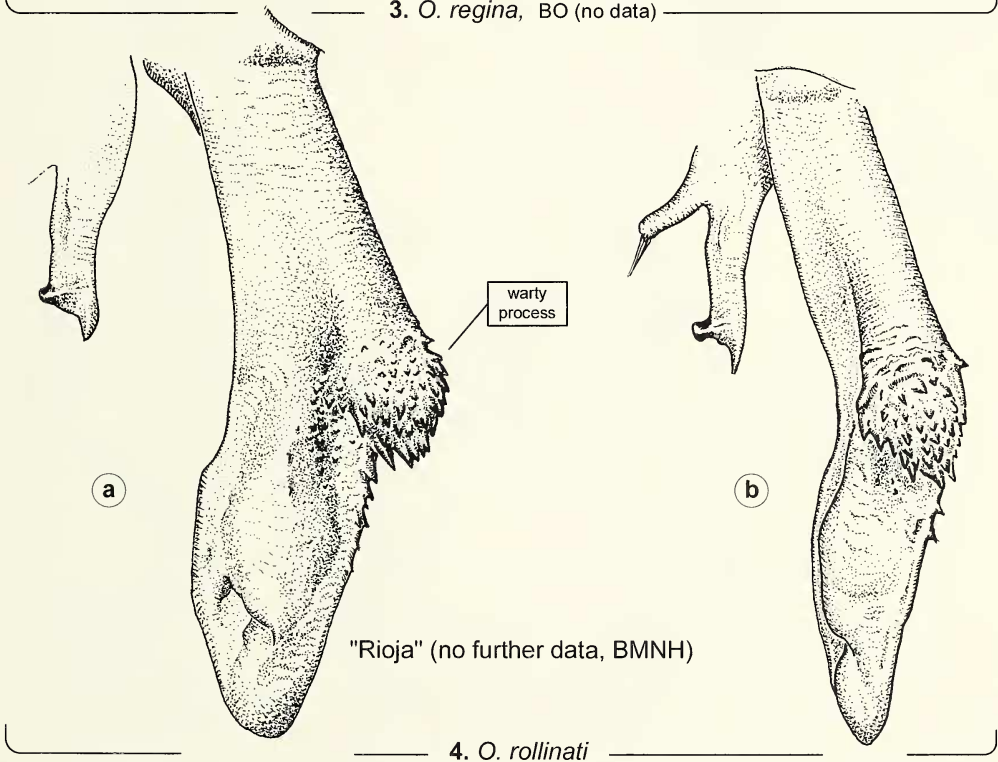
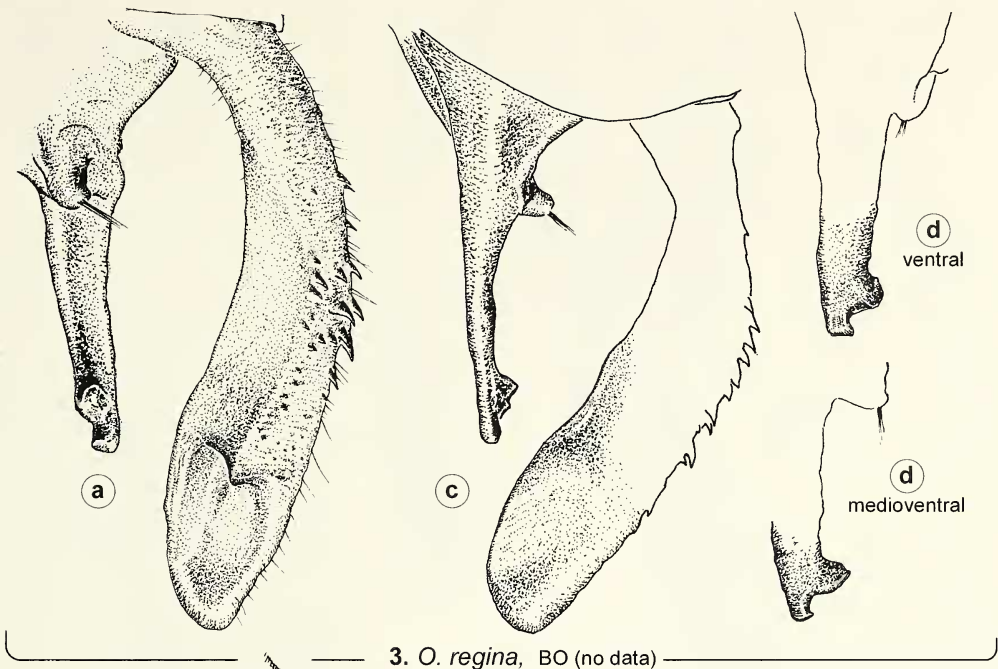
Figure 135 *Ormenophlebia imperatrix*, final stadium larva (figures not to scale)

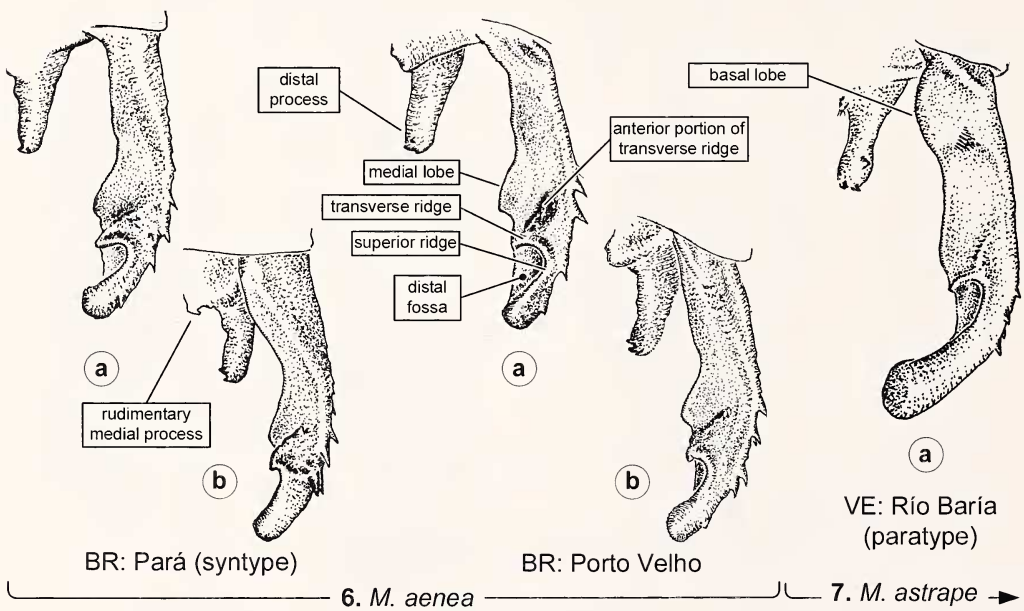
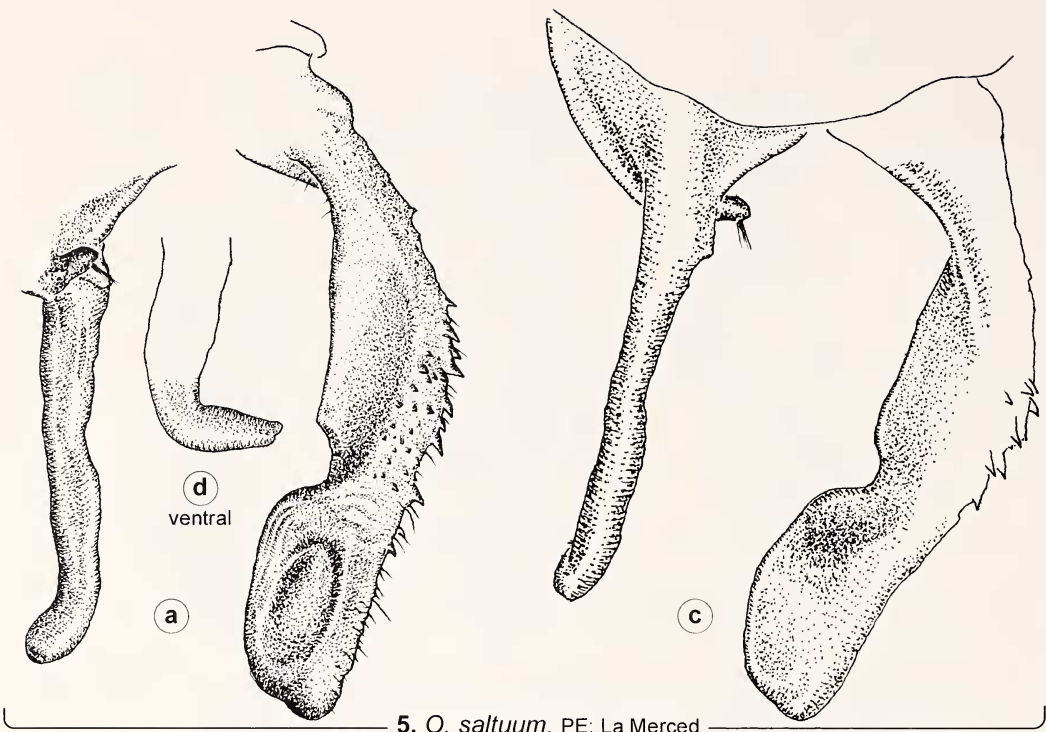
Figure 136 *Mnesarete grisea*, final stadium larva (figures not to scale)

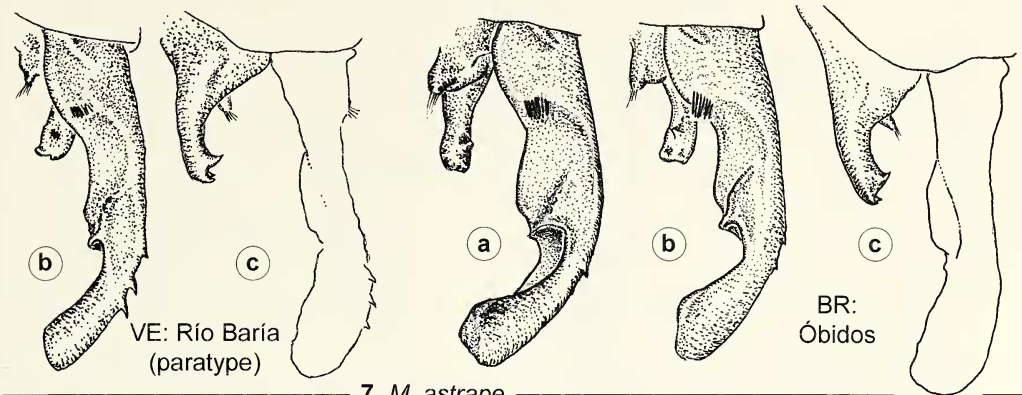
Figures 137–143 Male caudal appendages. 137. *Hetaerina brightwelli*. 138. *Mnesarete borchgravi*. 139. *Hetaerina charca*. 140. *Mnesarete grisea*. 141. *Hetaerina simplex*. 142. *Mnesarete fuscibasis*. 143. *Mnesarete pudica pudica*

Figures 144–160 Distribution maps. 144. *Bryoplatthanon* spp., *Iridictyon* spp., and *Ormenophlebia* spp. 145. *Mnesarete* spp. 146. *Bryoplatthanon globifer*. 147. *Ormenophlebia imperatrix*. 148. *Ormenophlebia saltuum*. 149. *Mnesarete grisea* and *Ormenophlebia* spp. 150. *Mnesarete* spp. 151–159. *Mnesarete* spp. 160. *Iridictyon* spp.

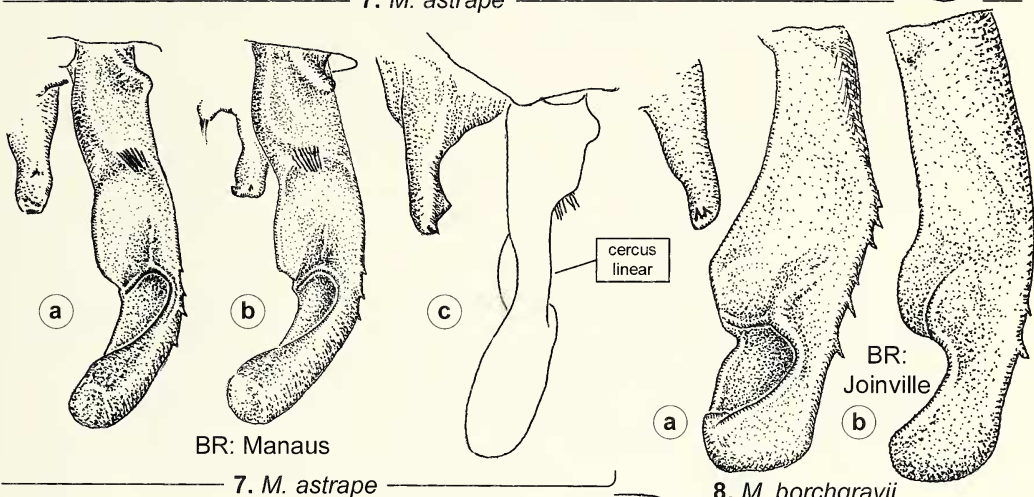






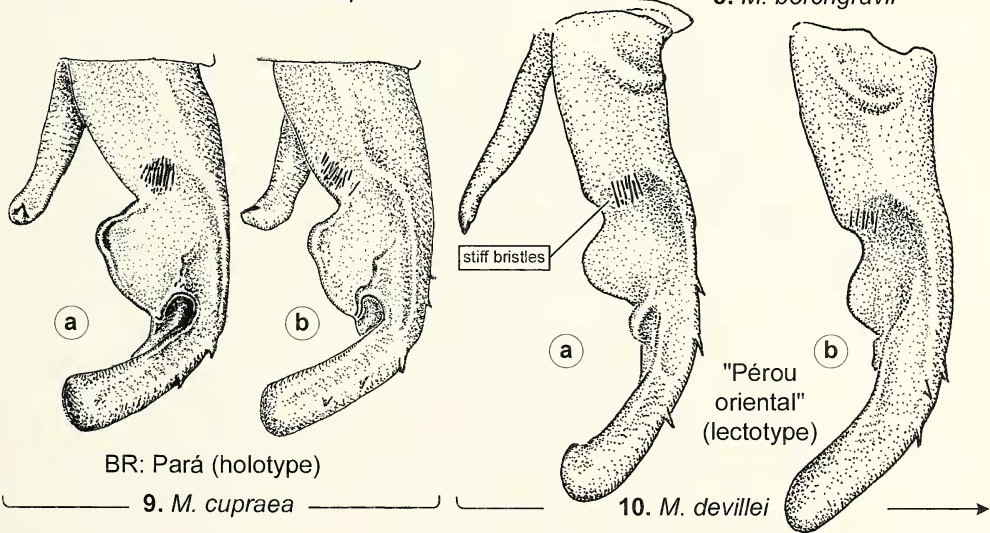


7. *M. astrape*



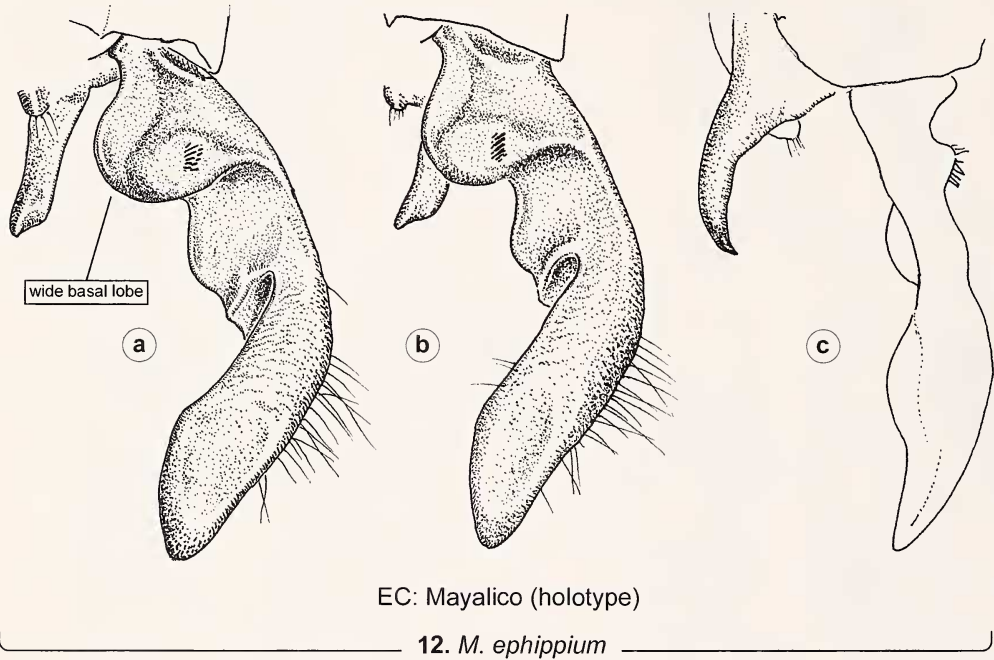
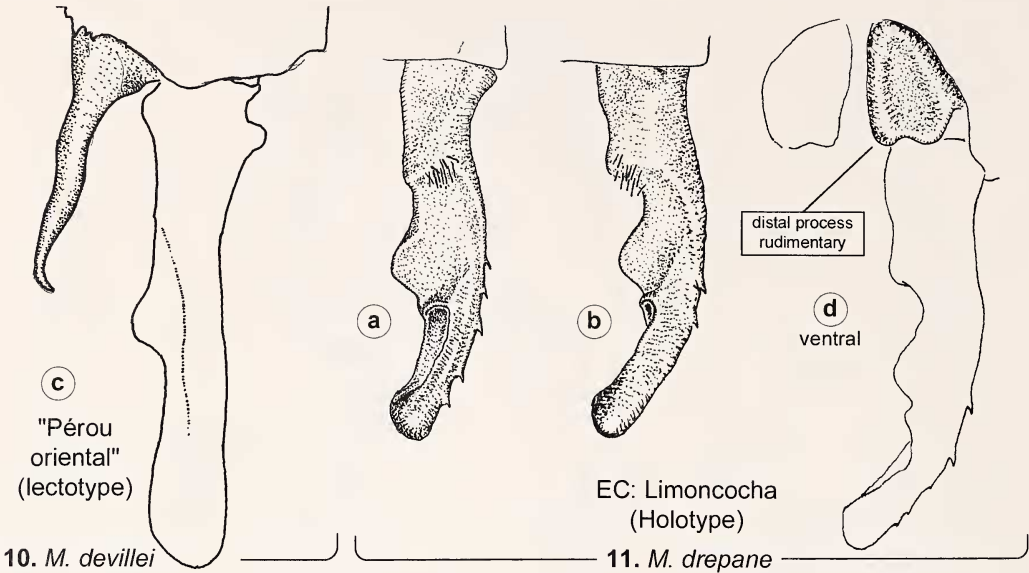
7. *M. astrape*

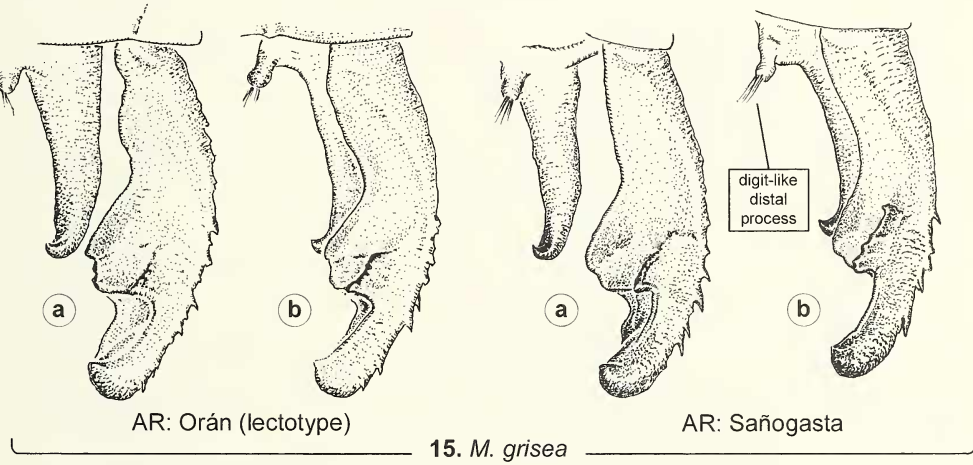
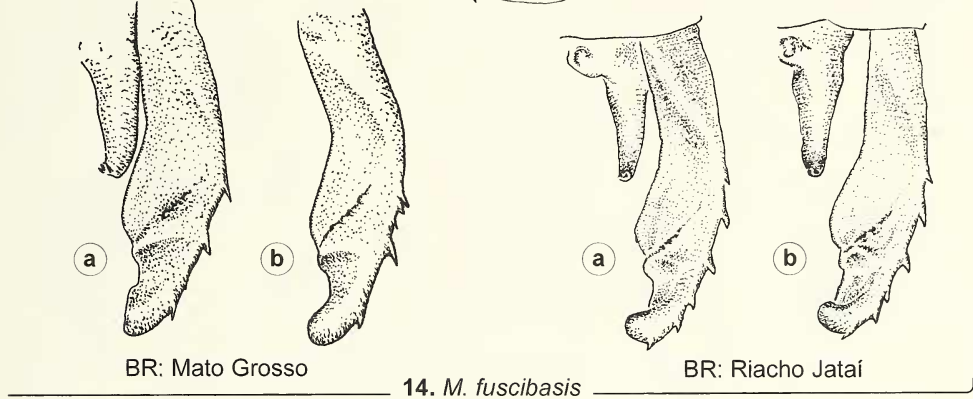
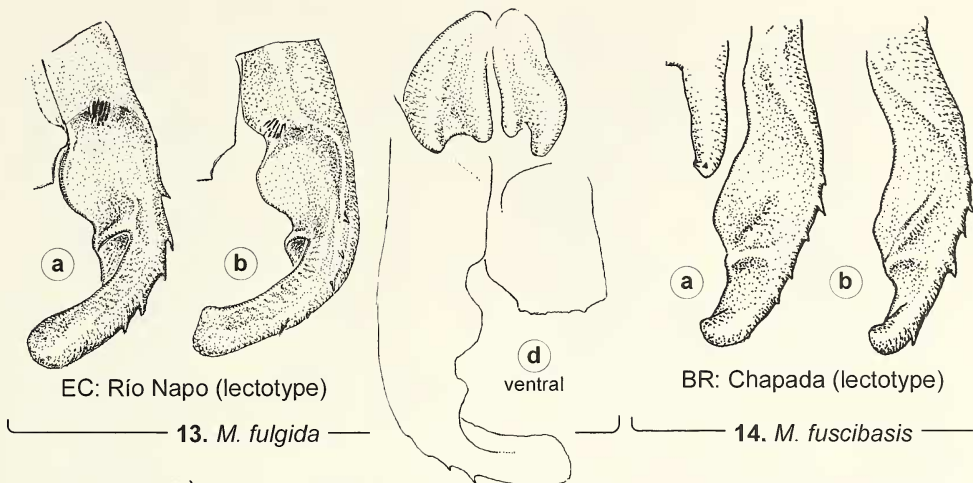
8. *M. borchgravi*

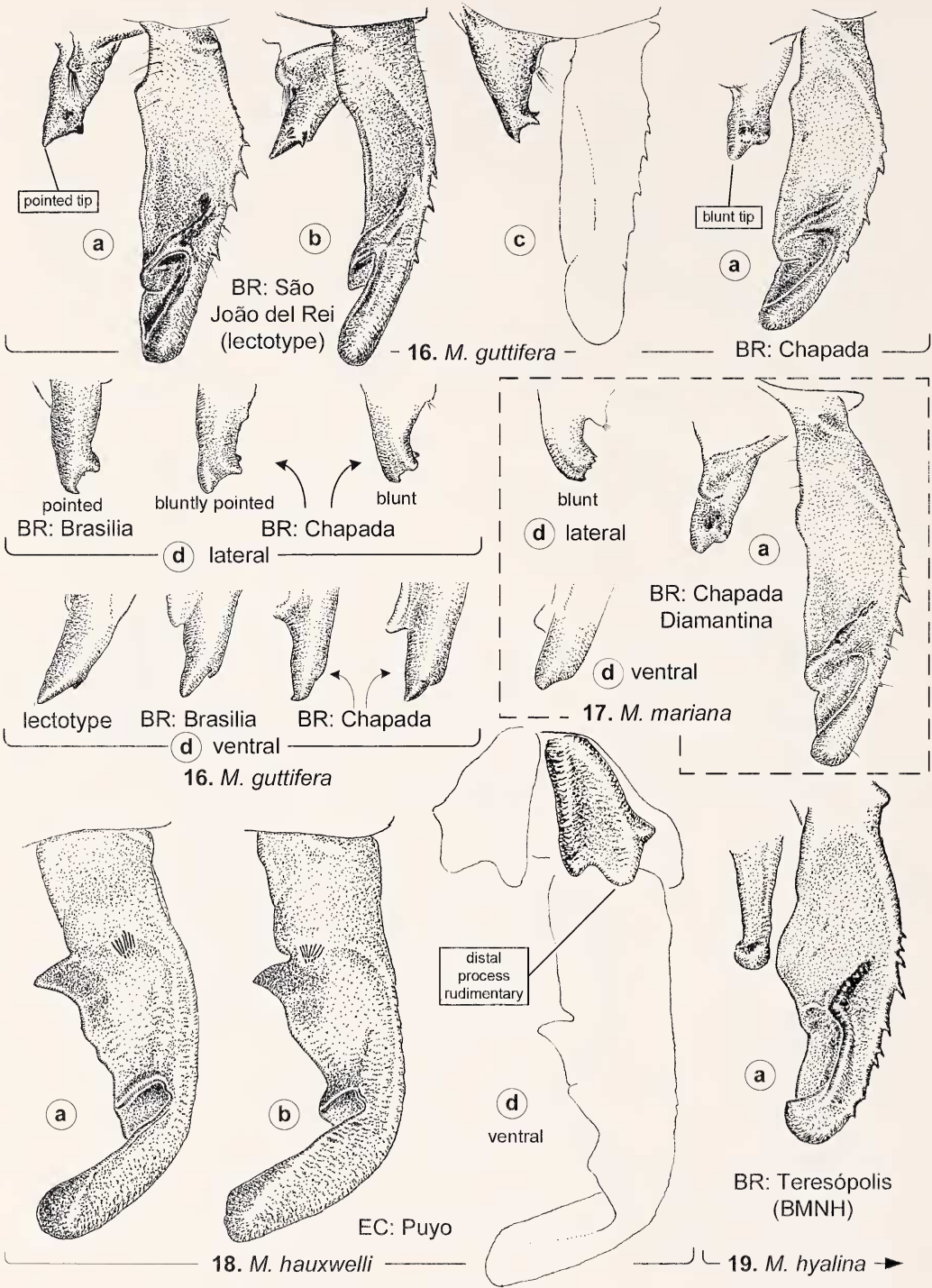


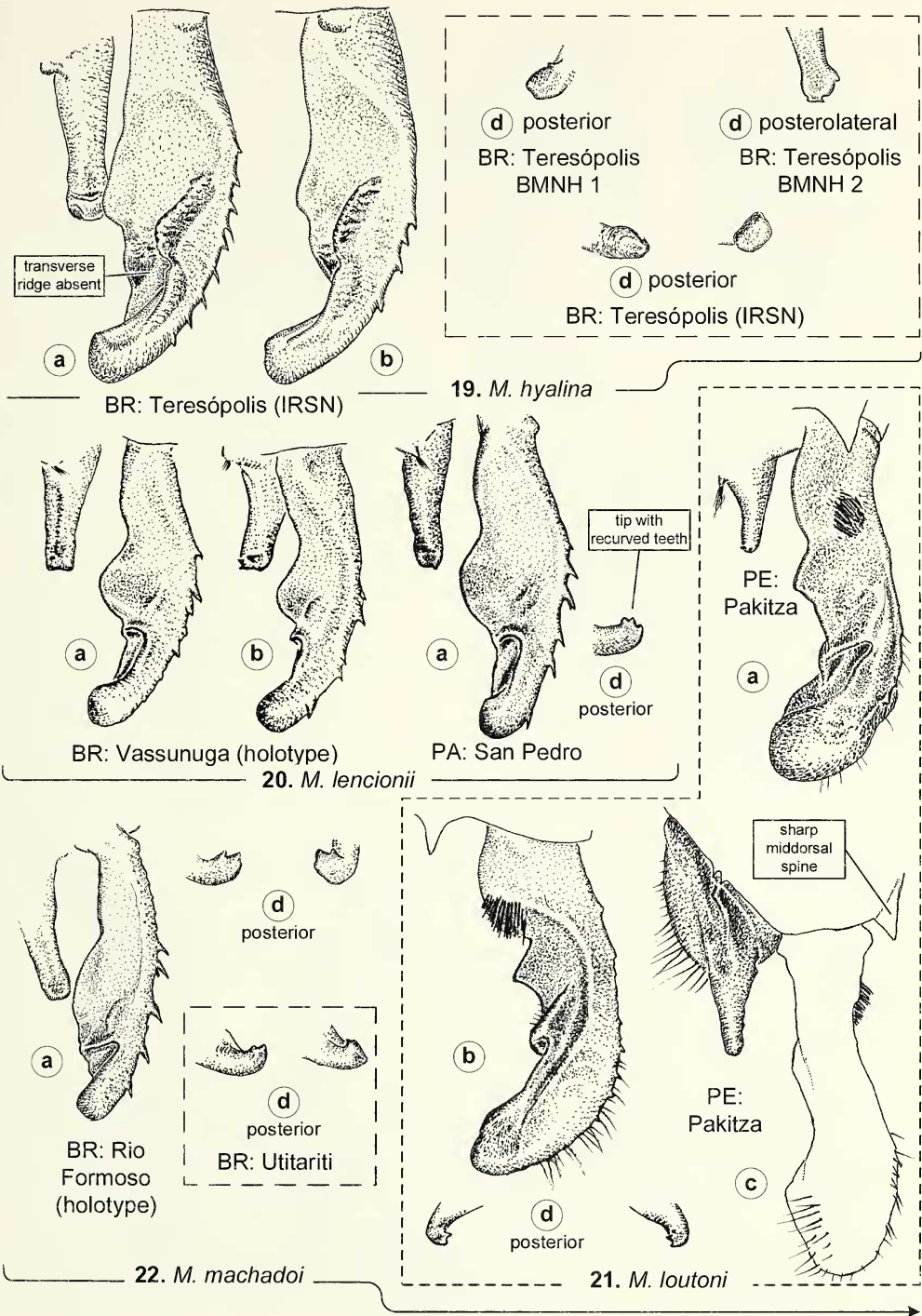
9. *M. cupraea*

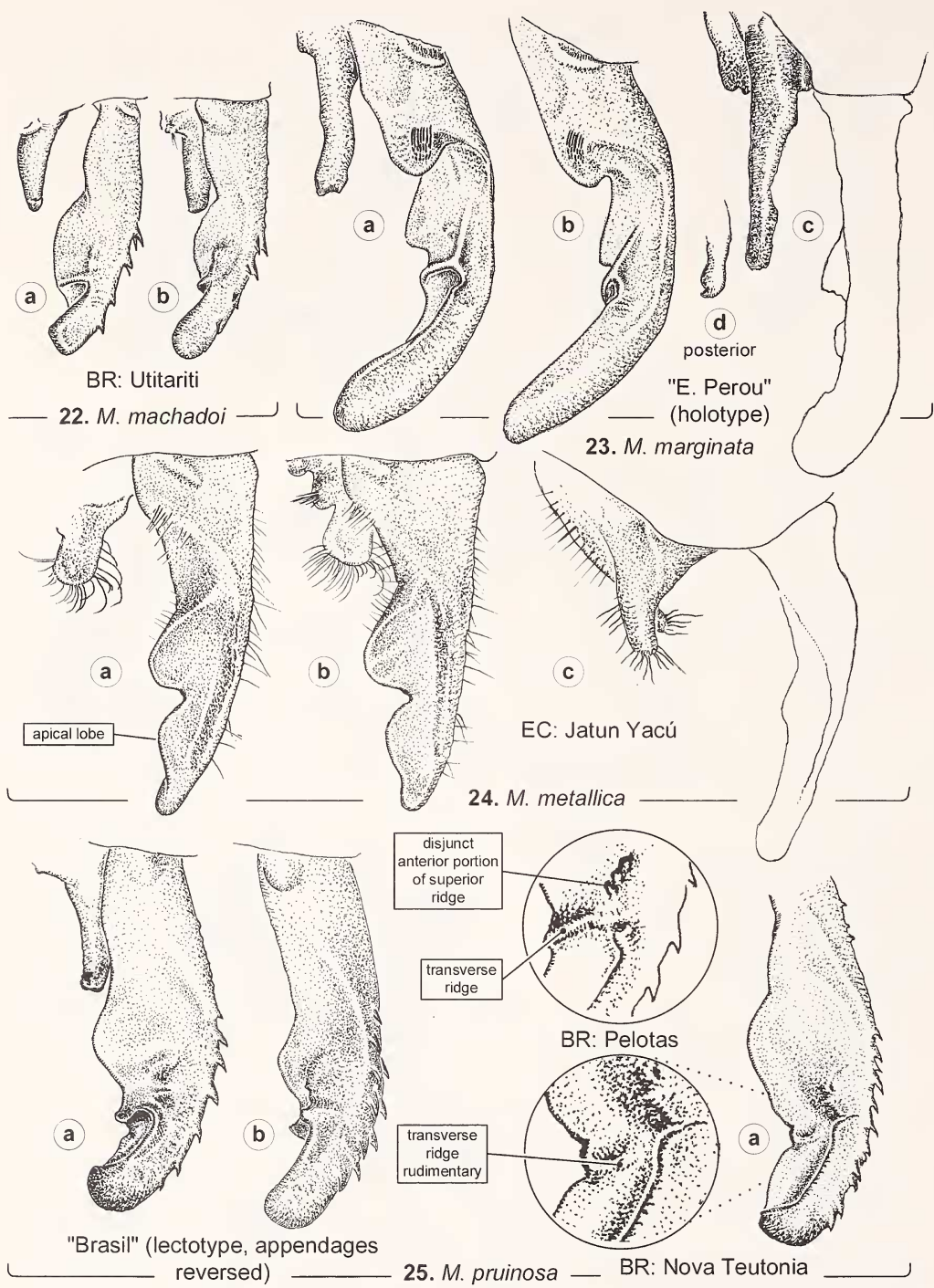
10. *M. devillei*

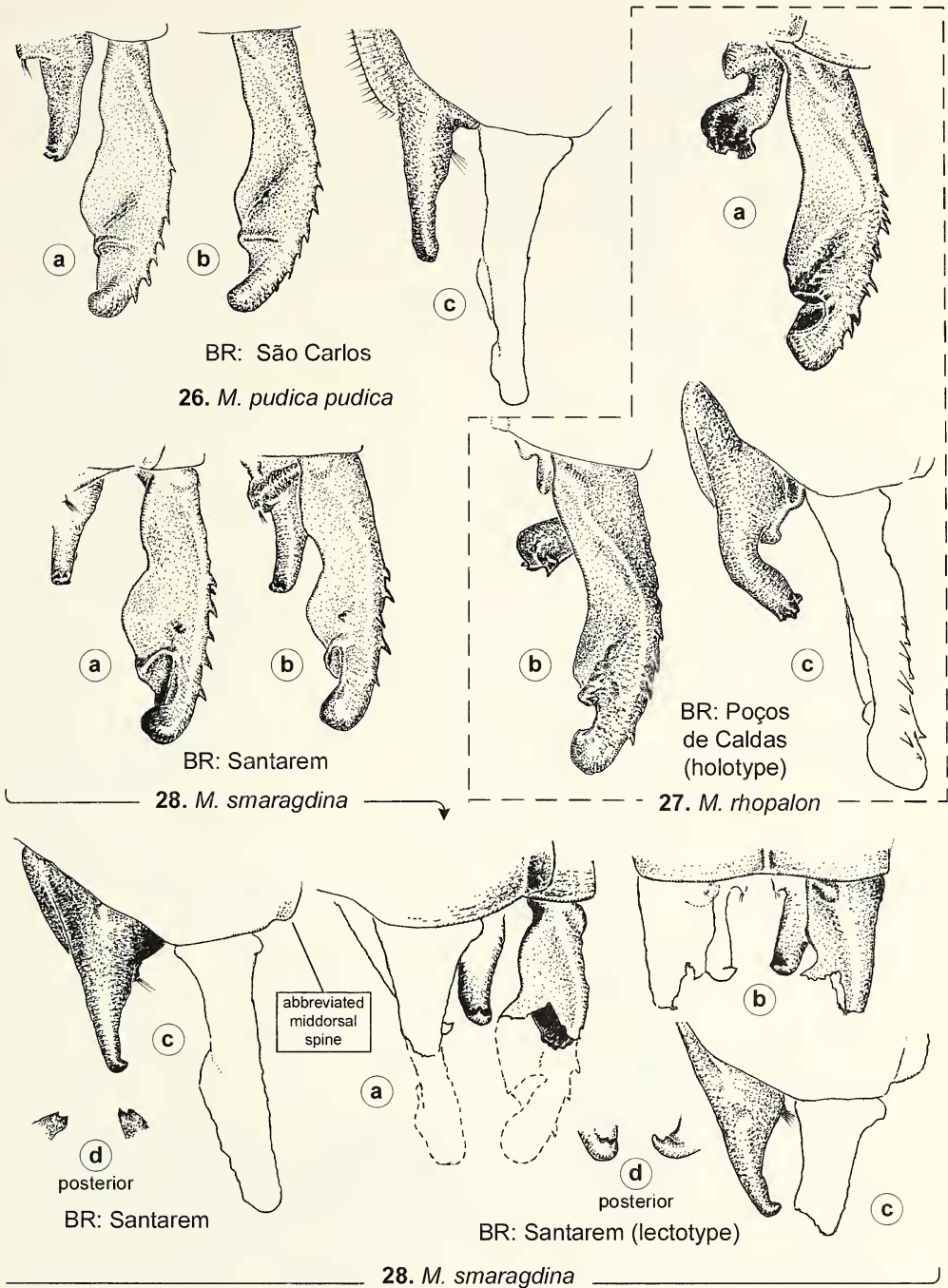


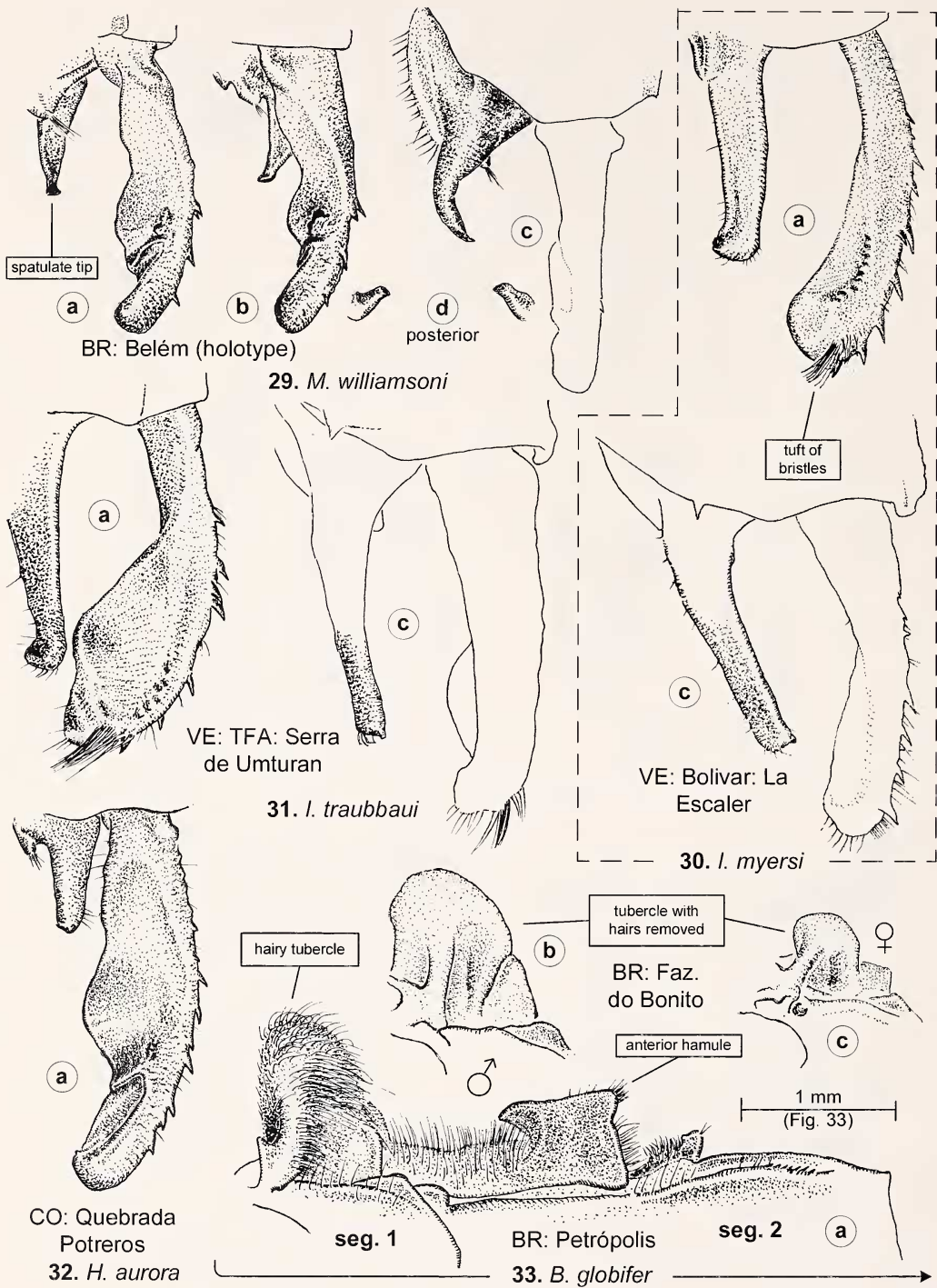


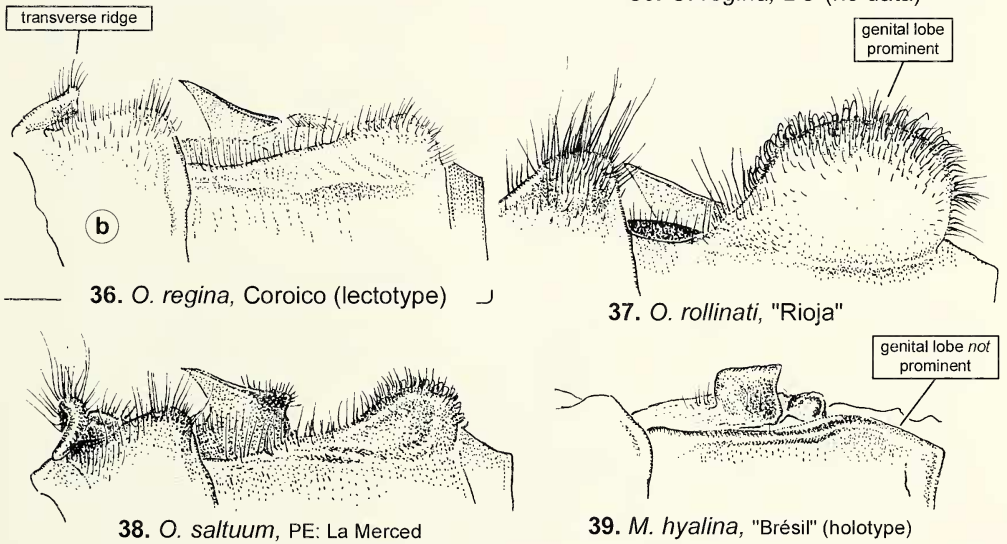
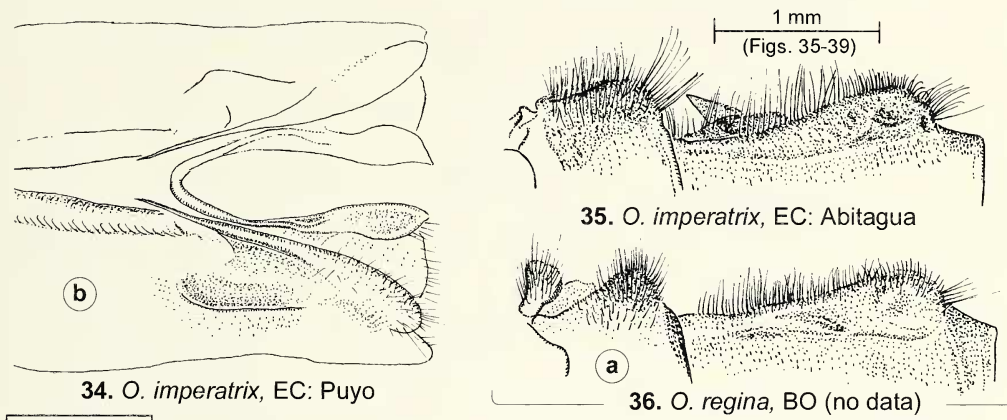
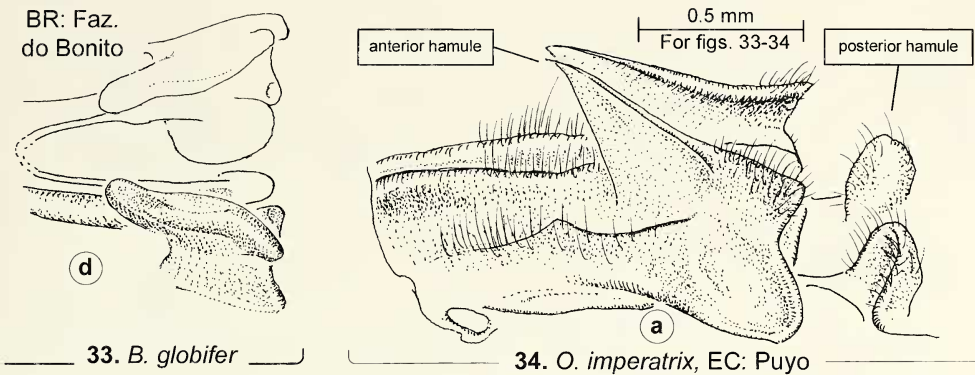


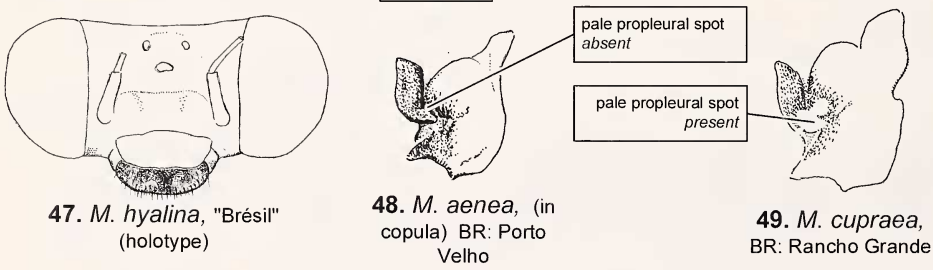
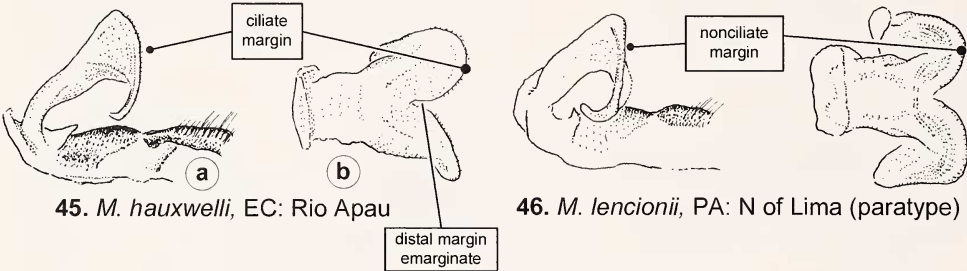
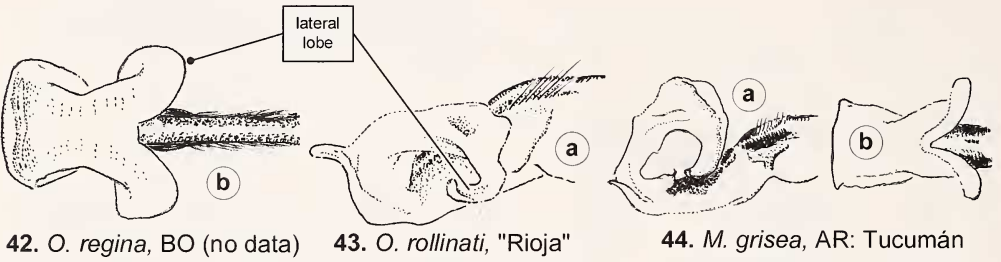
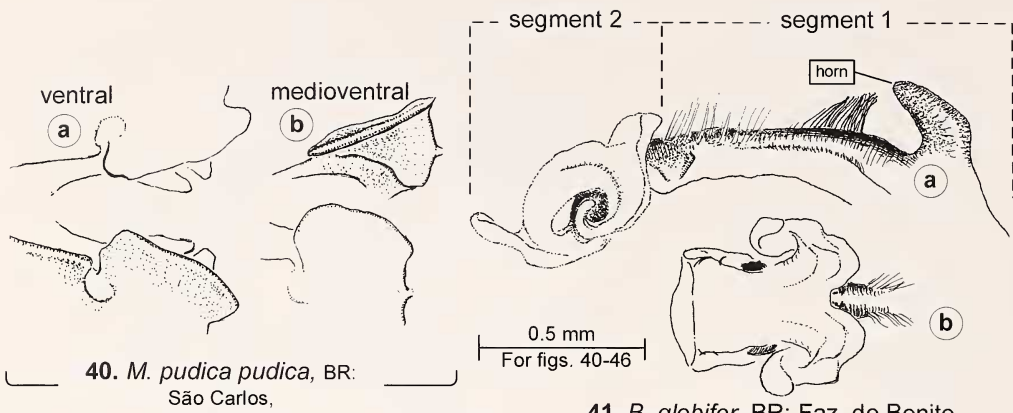


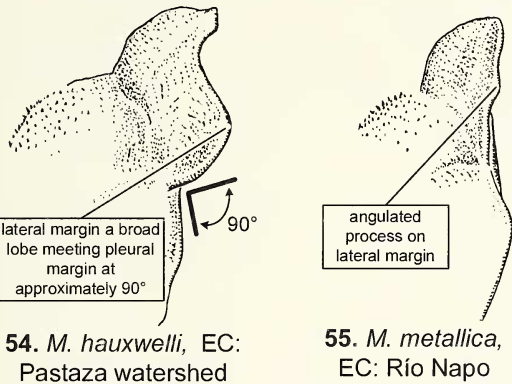
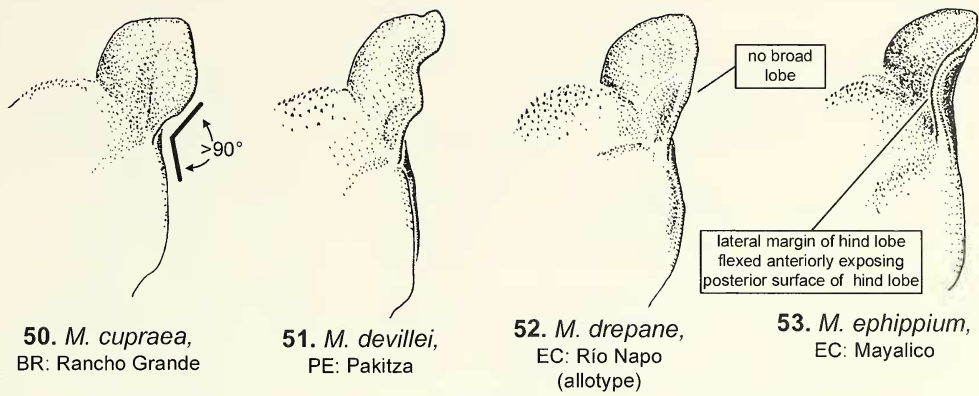




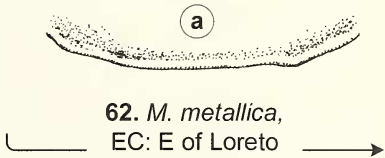
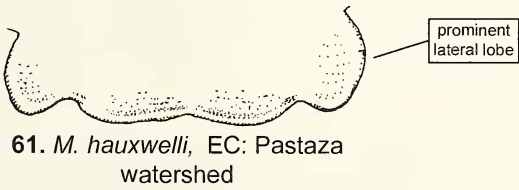
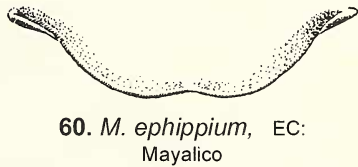
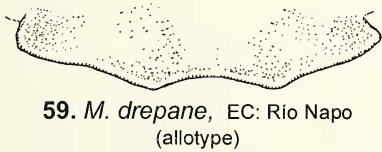
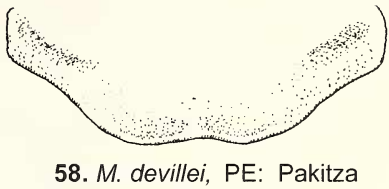
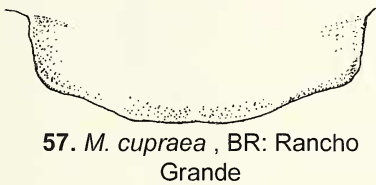
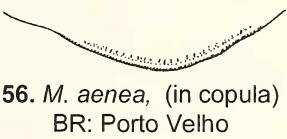


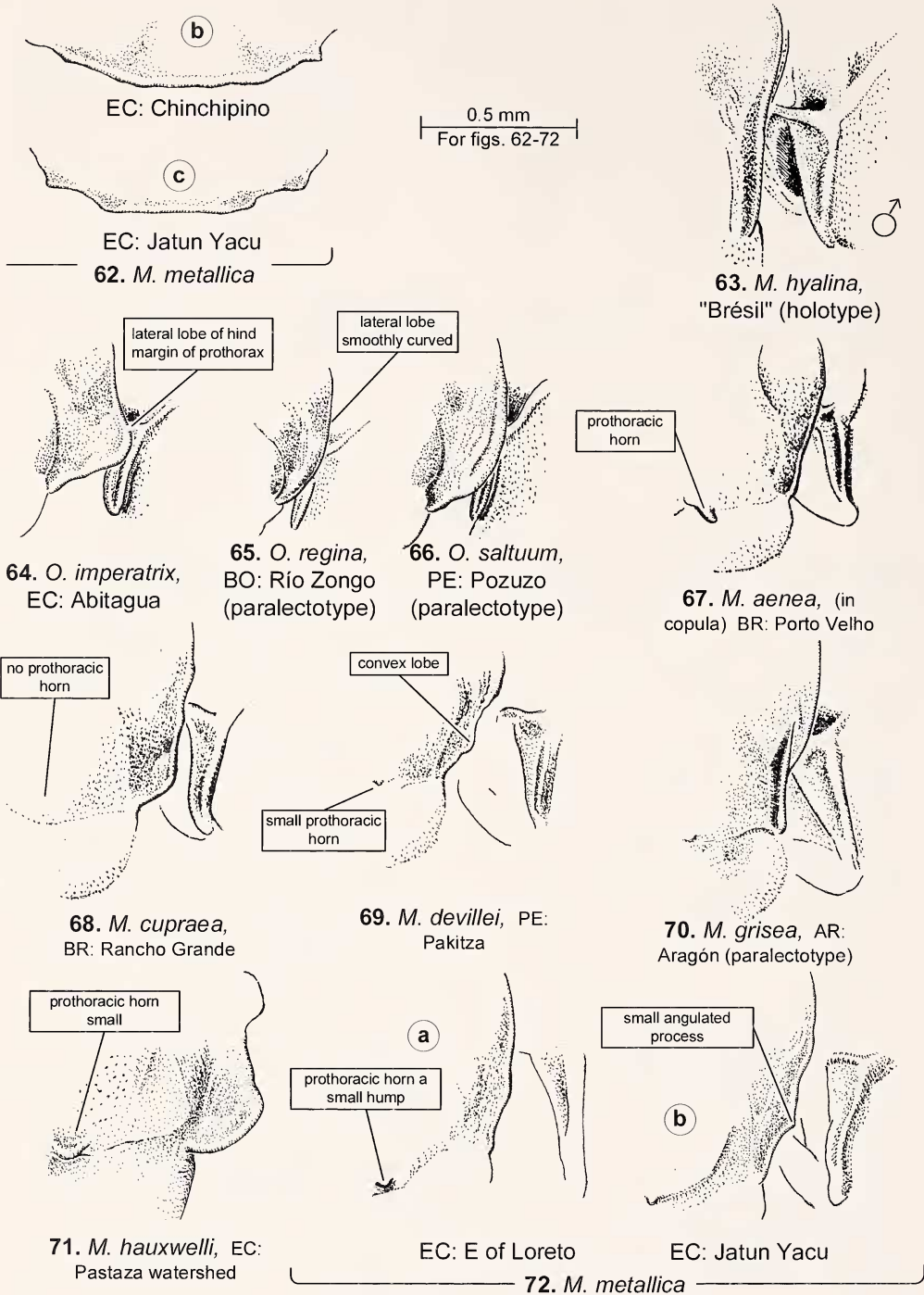


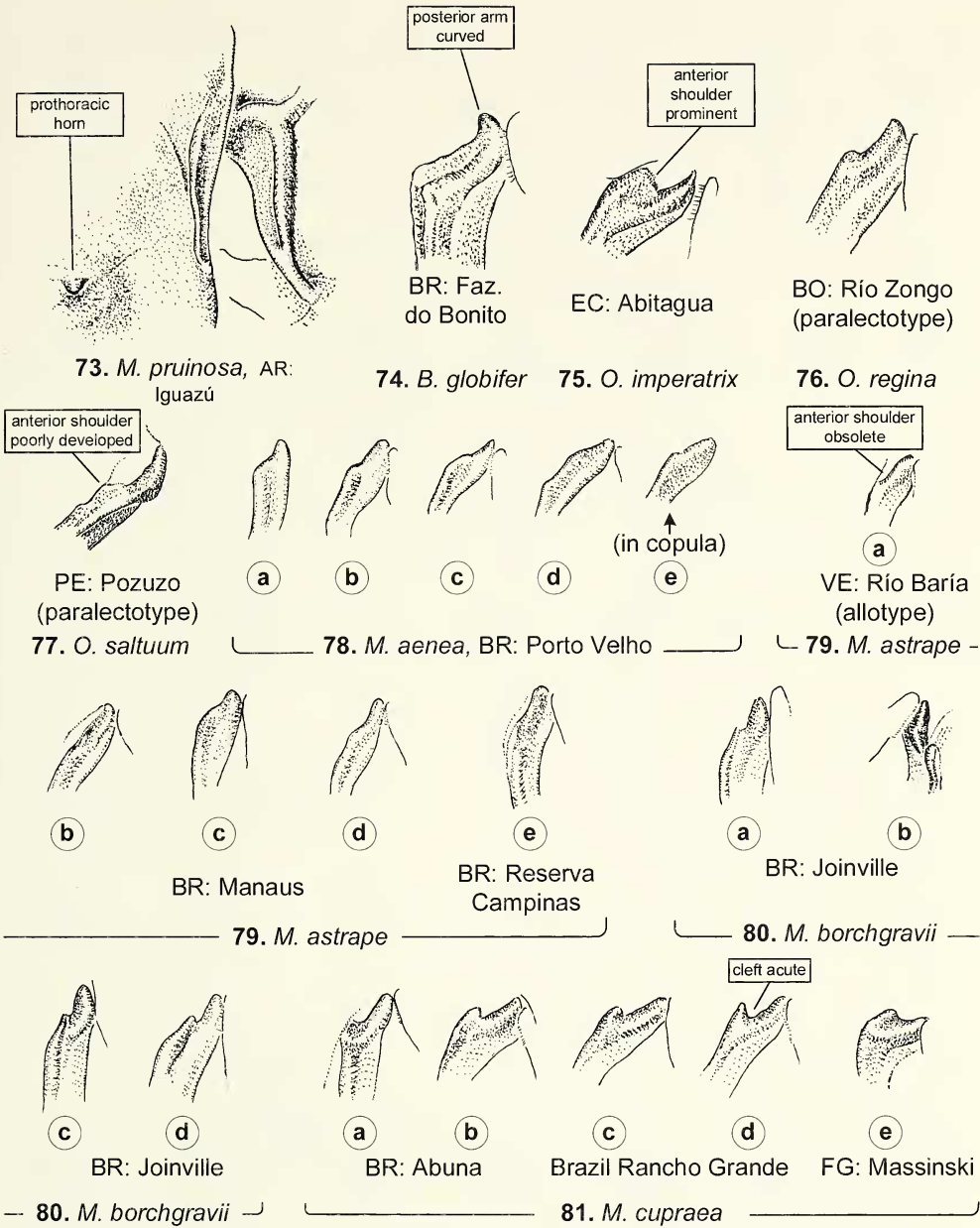


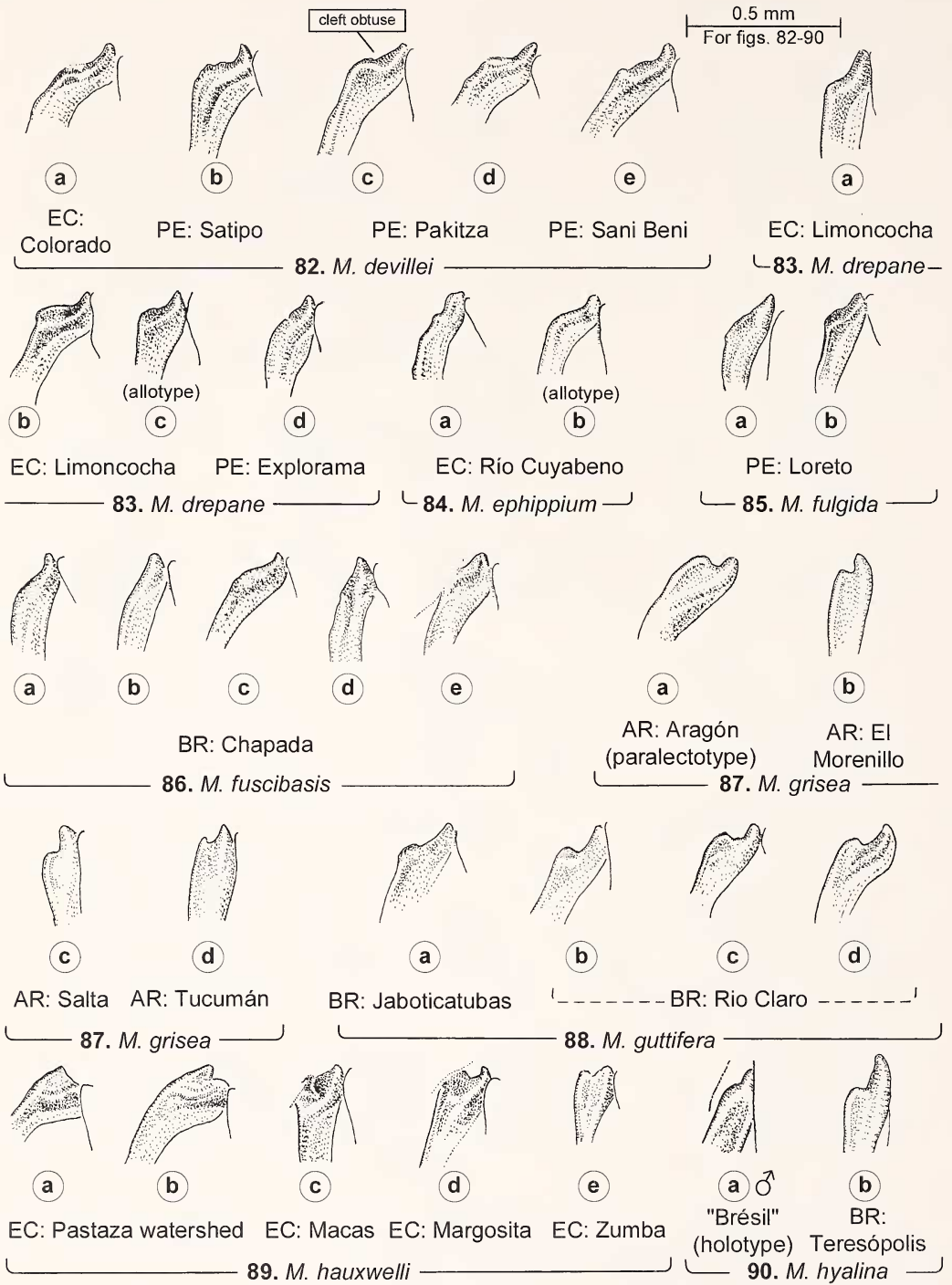


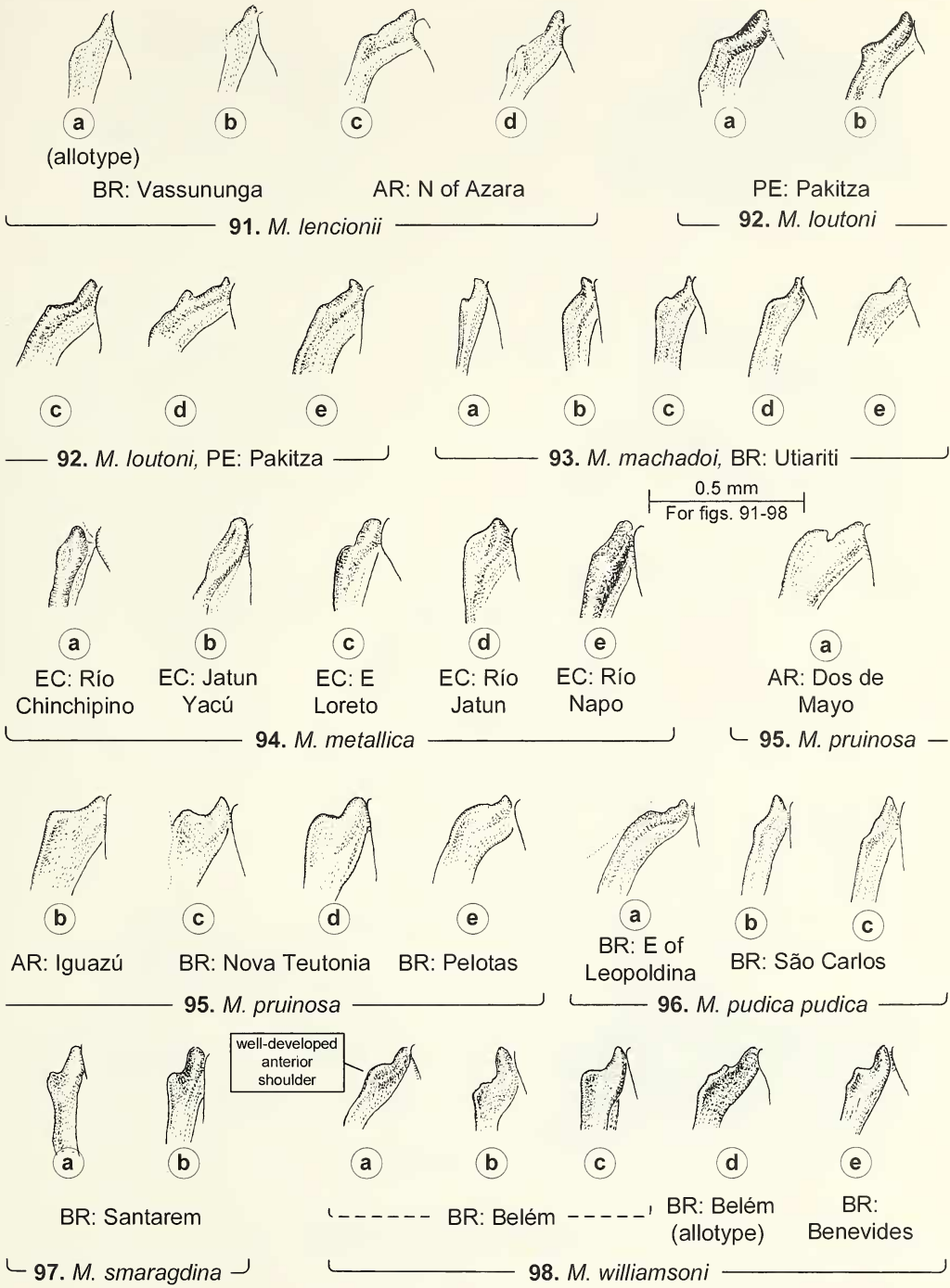
0.5 mm
For figs. 50-62

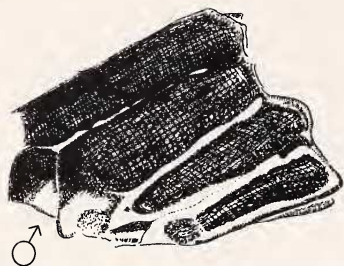




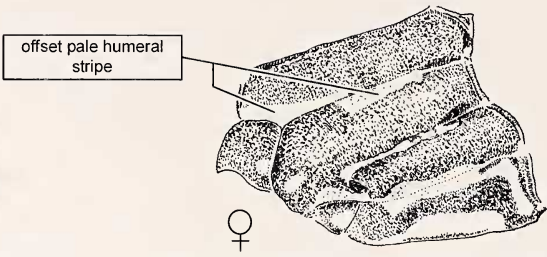






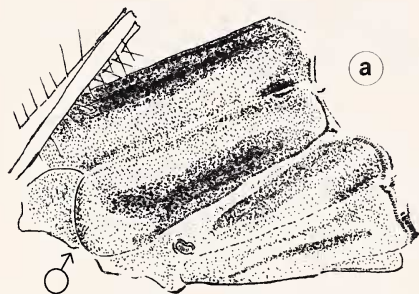


99. *M. cupraea*, BR: Rancho Grande

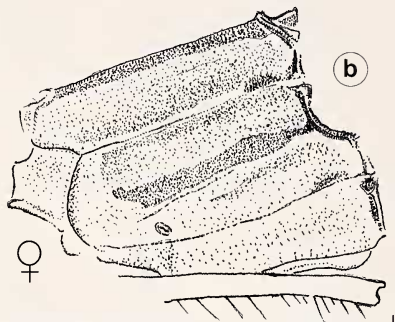


offset pale humeral stripe

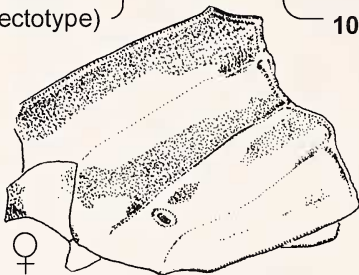
100. *M. fuscibasis*, BR: Mato Grosso



101. *M. grisea*, AR: Orán (lectotype)

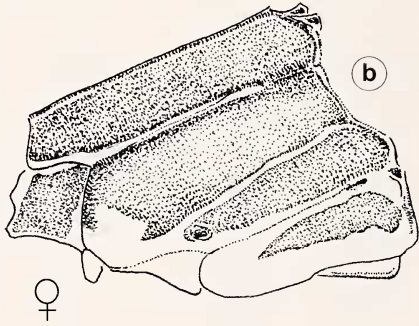
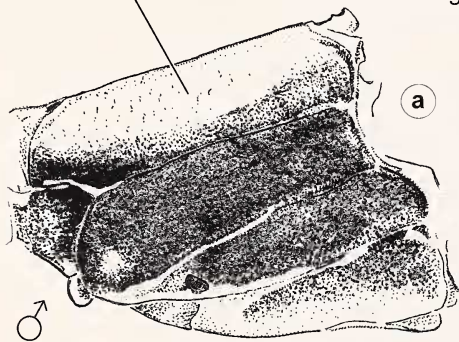


101. *M. grisea*, AR: Aragón (paralectotype)

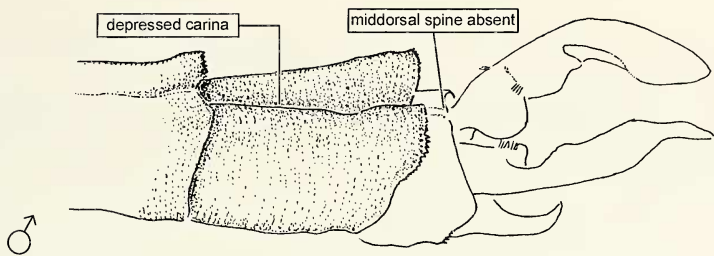


BR: São João del Rei
102. *M. guttifera* (juvenile)

white pruinosity on mesepisternum



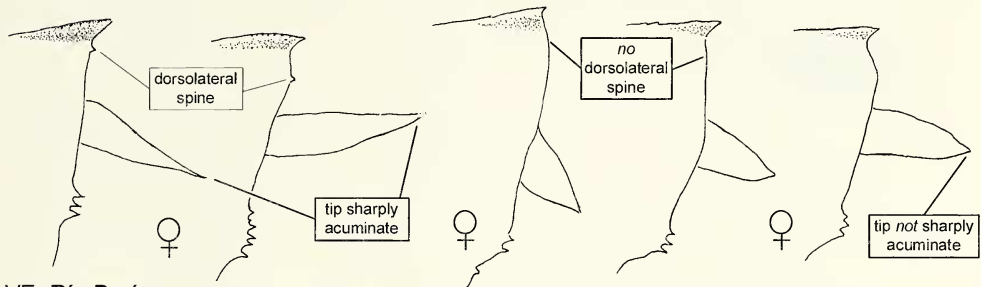
103. *M. pruinosa*, BR: Nova Teutonia



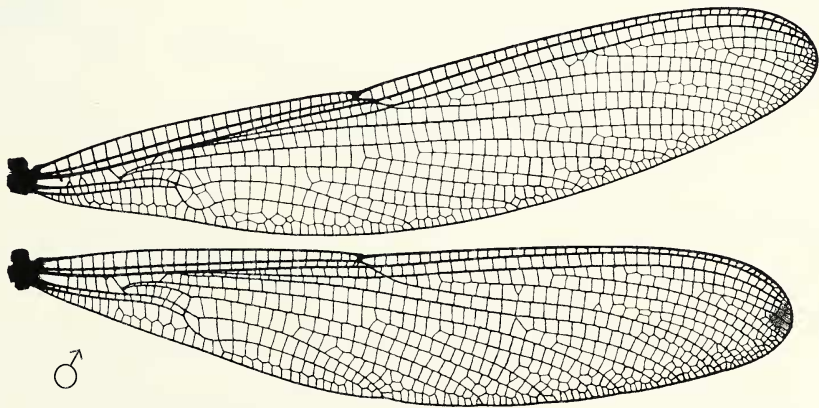
104. *M. ephippium*, EC: Mayalico (holotype)



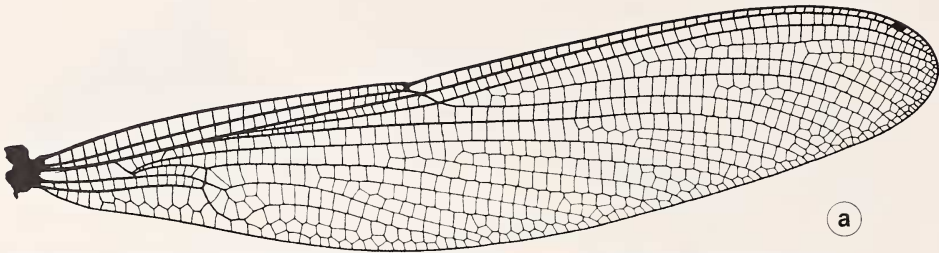
105. *M. metallica*, EC: Jatun Yacu



VE: Río Baría (allotype) BR: Manaus BR: Santarem BR: Belém BR: Benevides
106. *M. astrape* 107. *M. smaragdina* 108. *M. williamsoni*



109. *B. globifer*, BR: Faz. do Bonito



110. *O. saltuum*, PE: La Merced



b



Hind wing pterostigma



c



Forewing

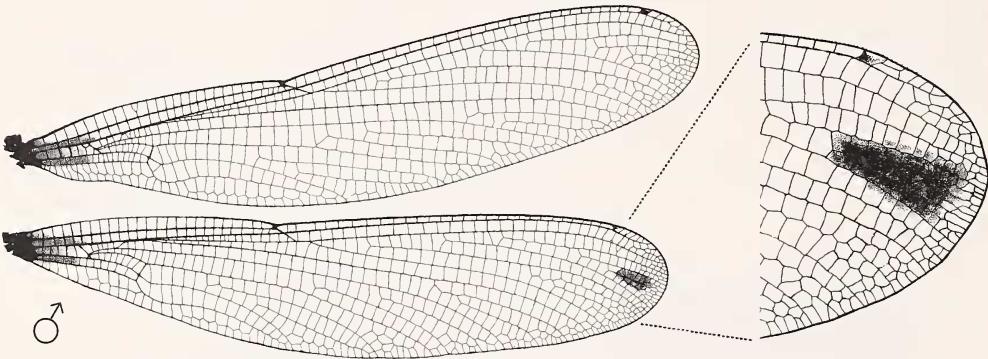


d



Hind wing pterostigma

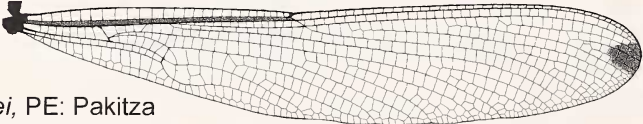
110. *O. saltuum*, PE: La Merced

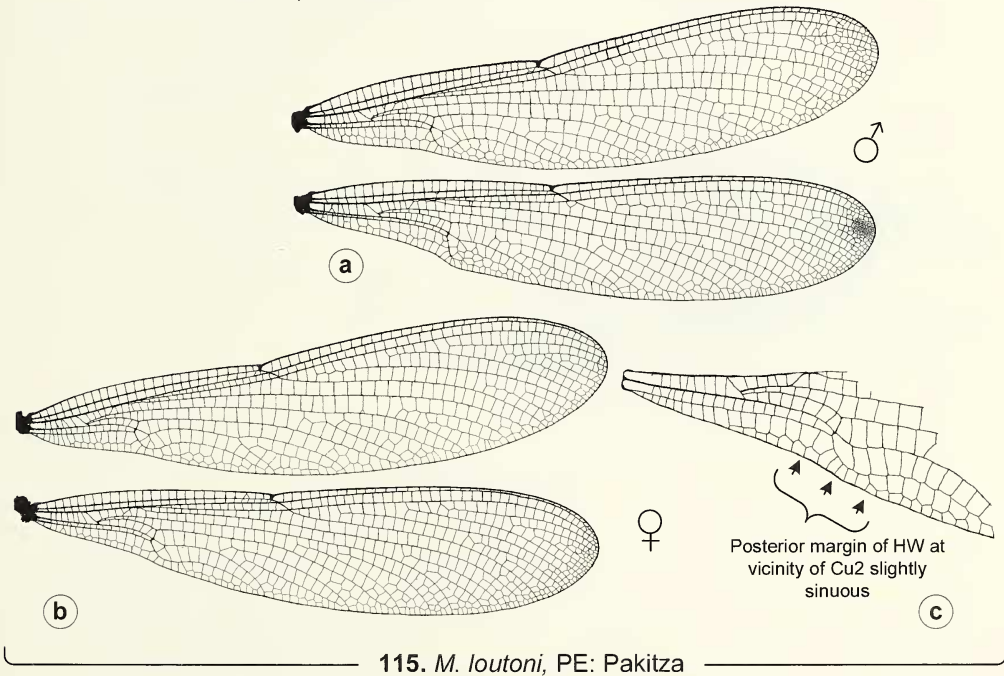
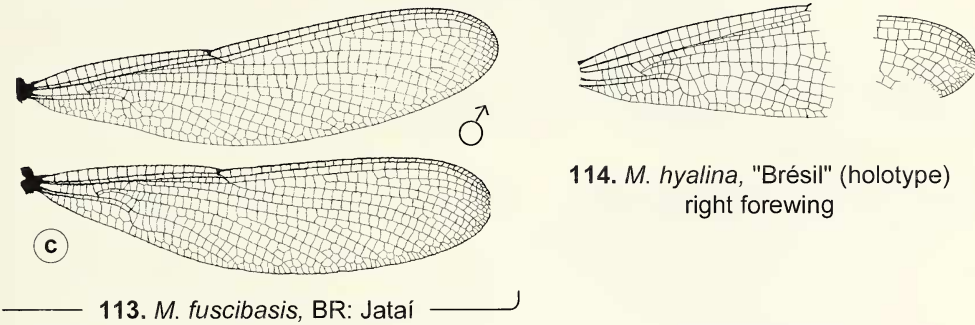
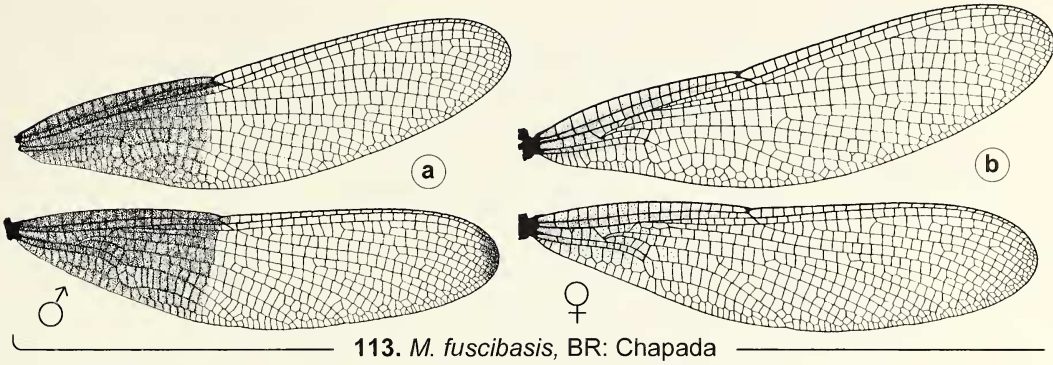


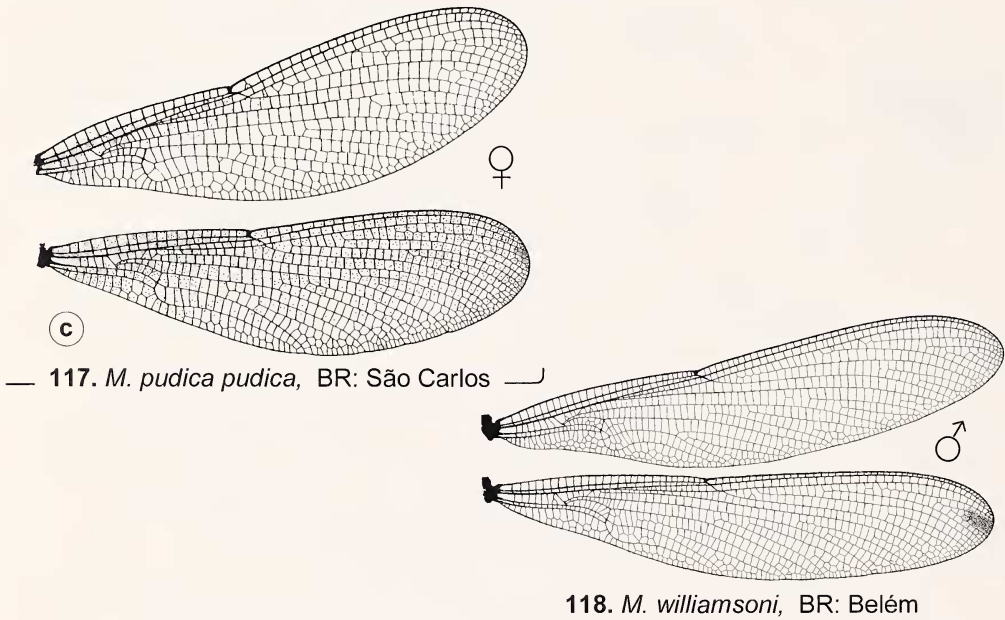
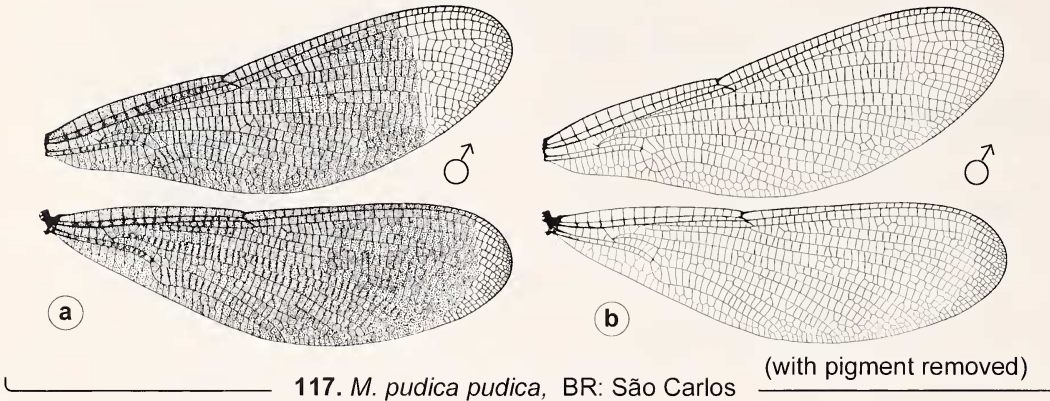
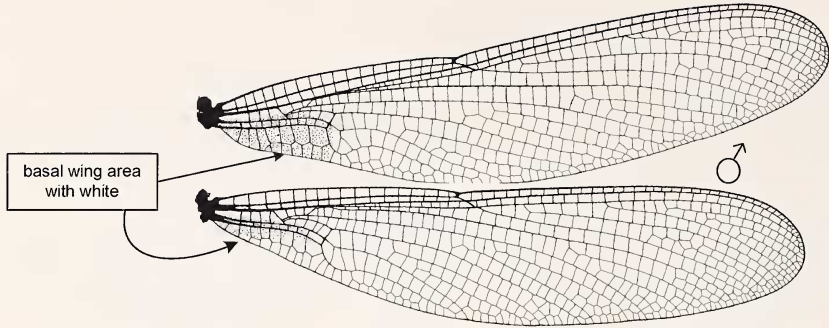
111. *M. borchgravii*, BR: Joinville

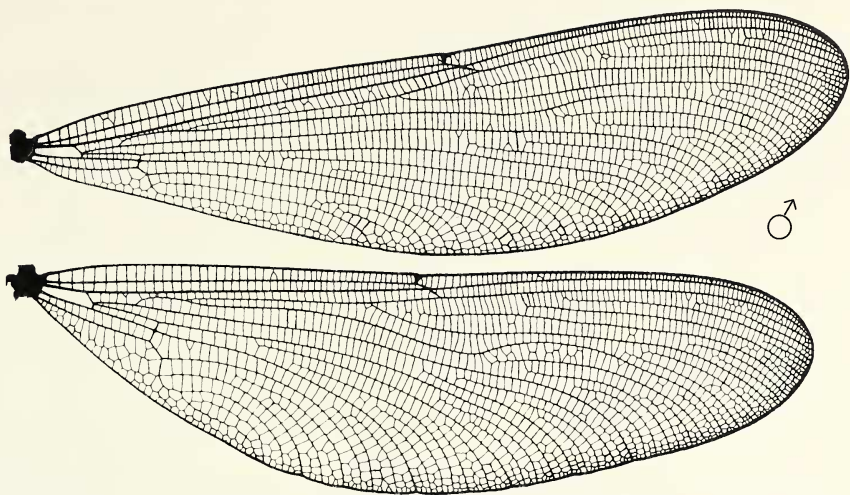


112. *M. devillei*, PE: Pakitza

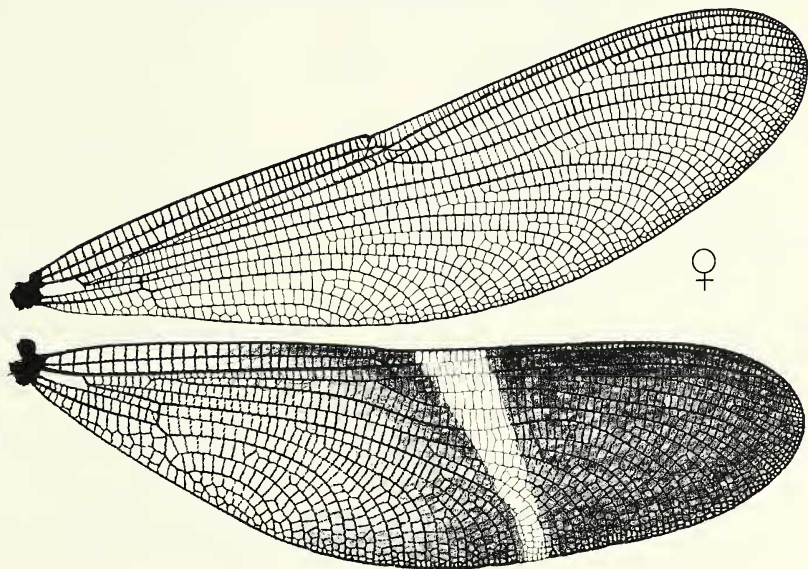




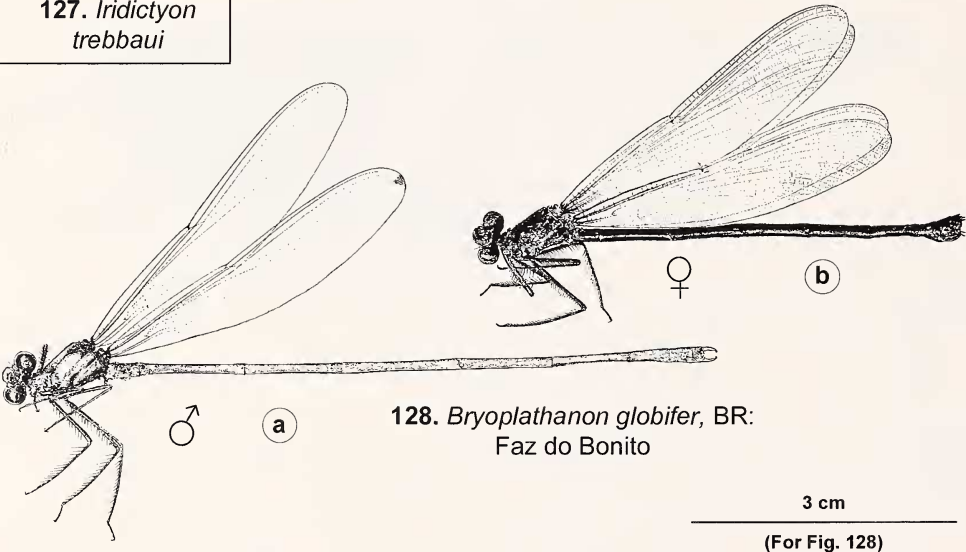
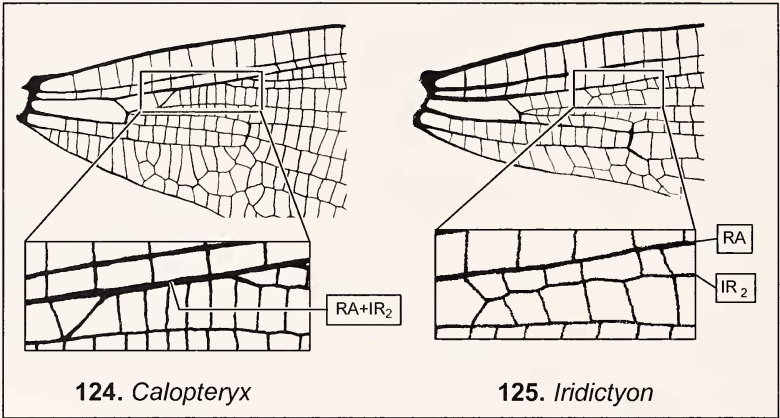
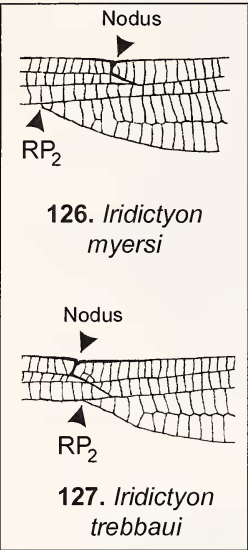
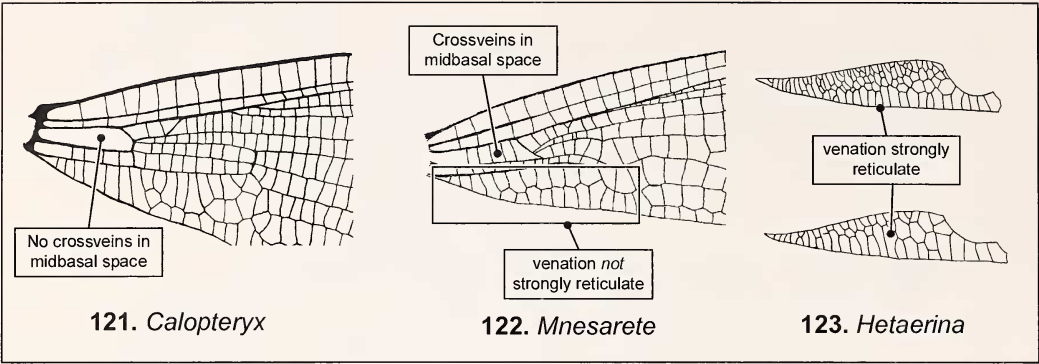




119. *I. myersi*, VE: Bolivar: La Escalera

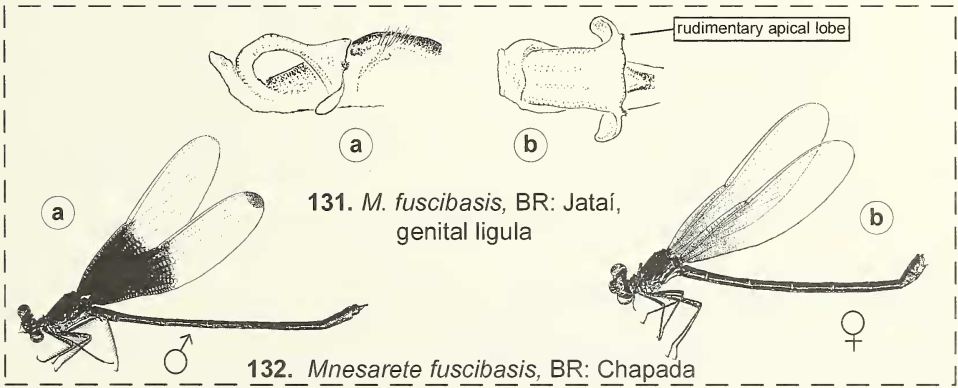
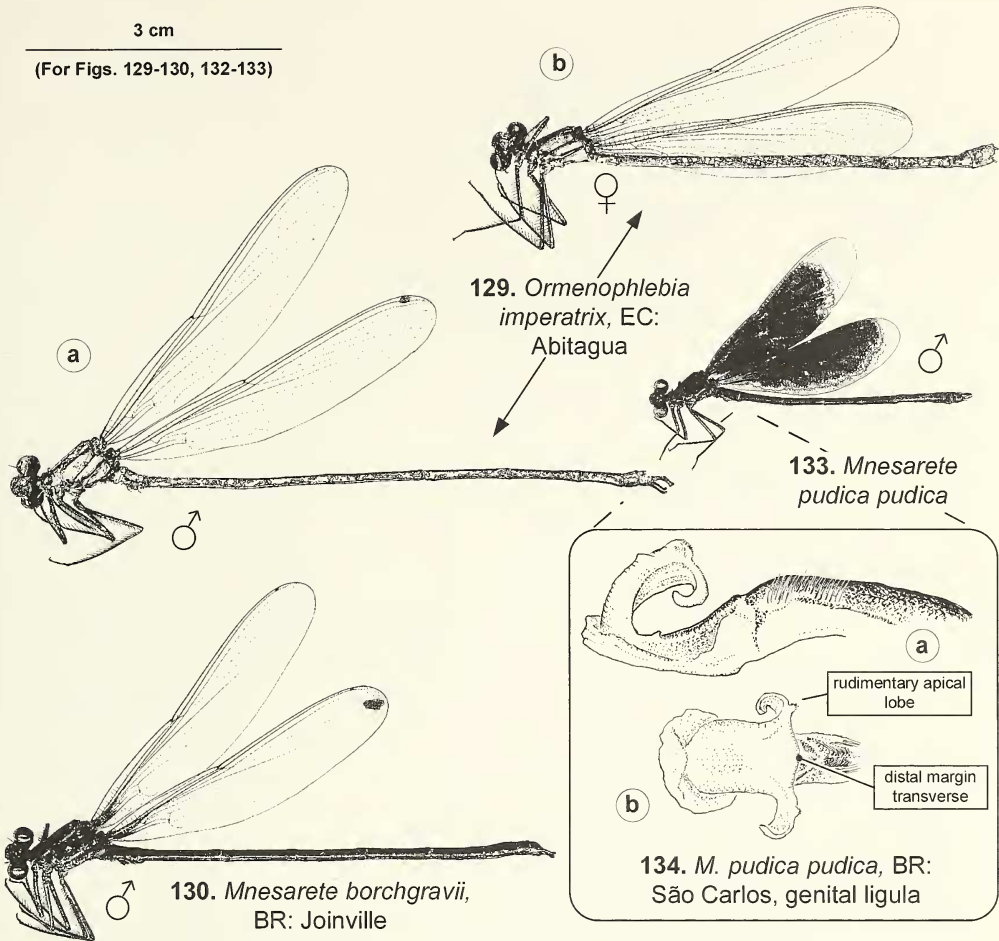


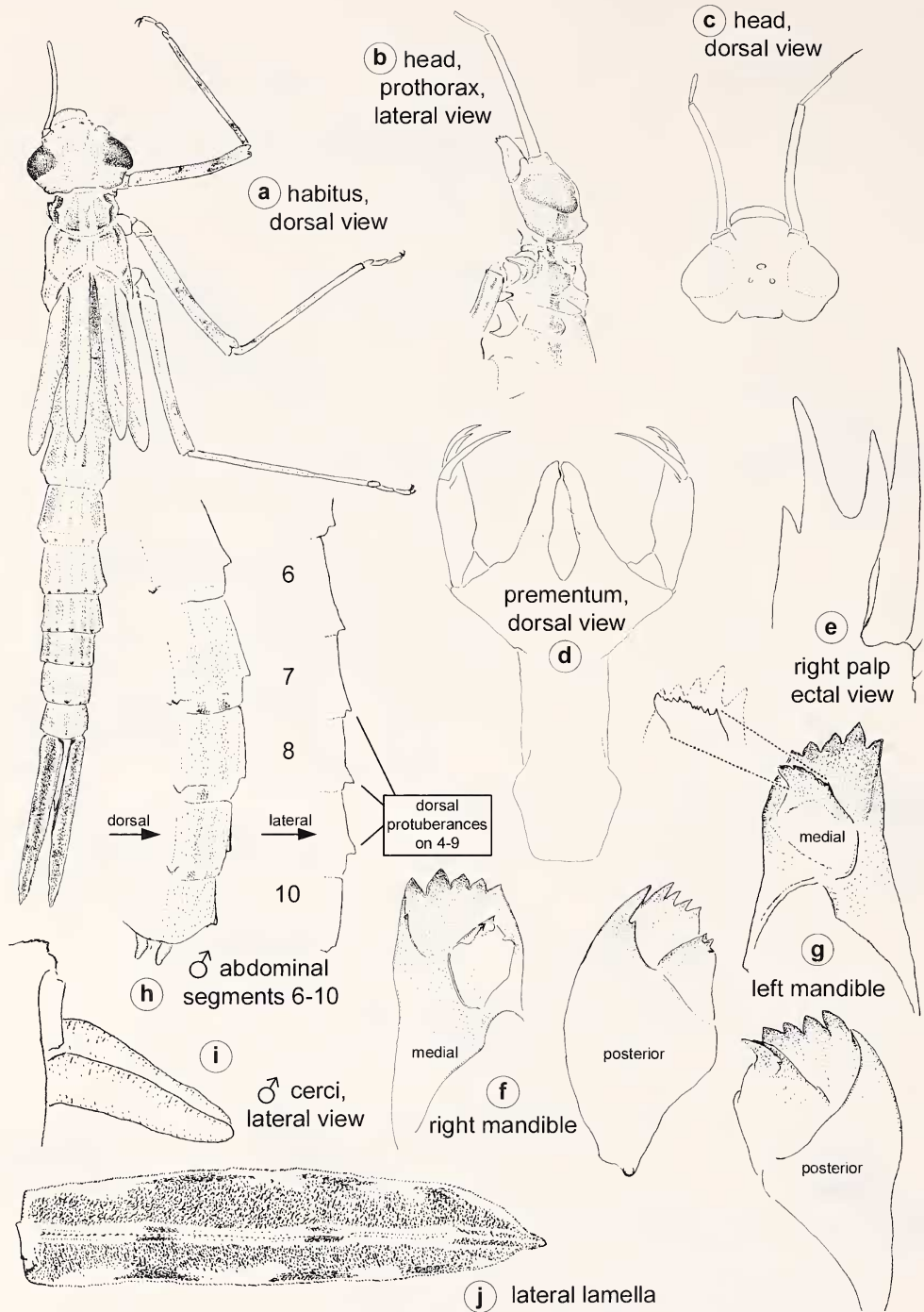
120. *I. trebbau*, VE: Sierra de Unturán



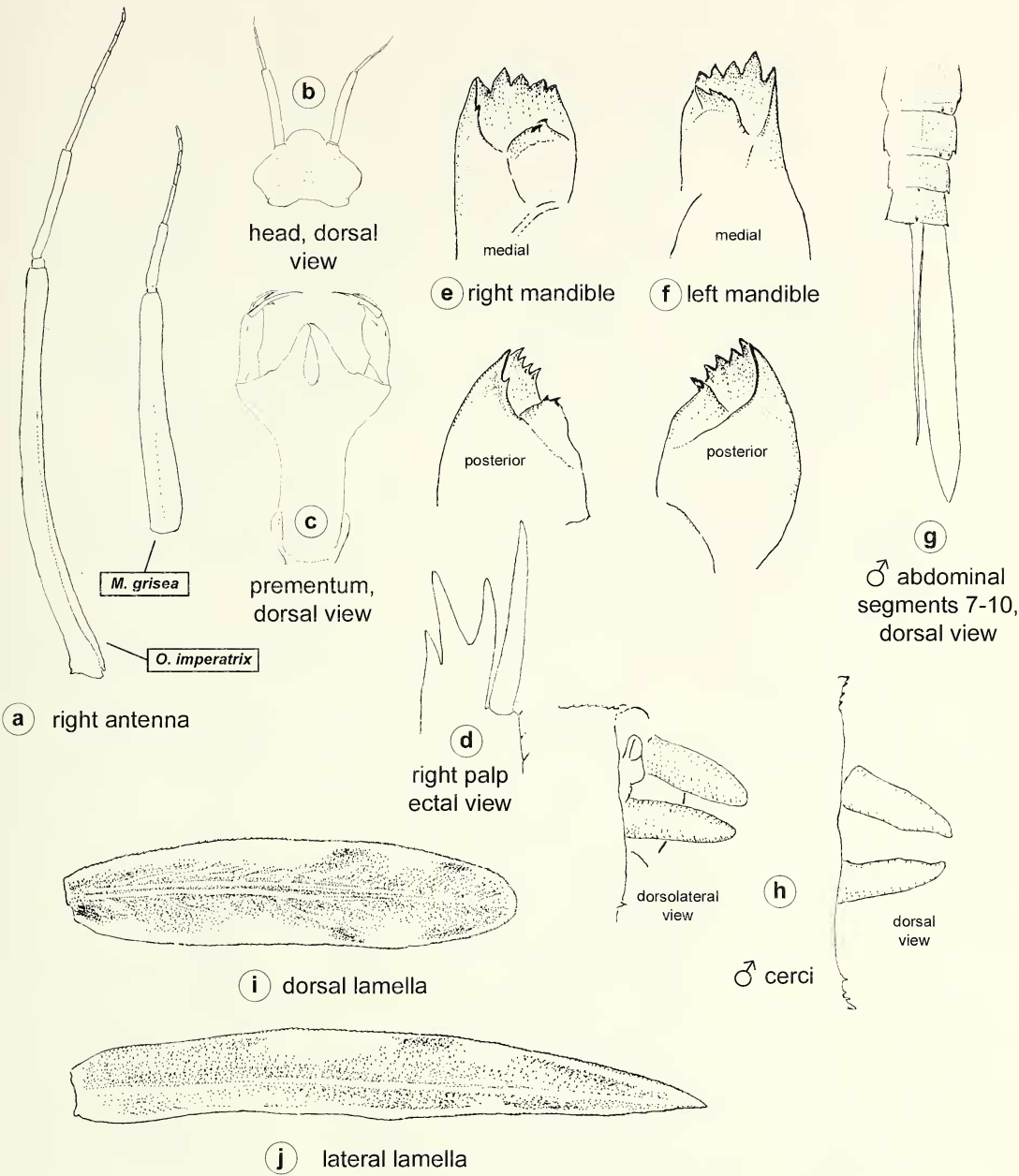
3 cm

(For Figs. 129-130, 132-133)





135. *Ormenophlebia imperatrix*, EC: Baeza



136. *Mnesarete grisea*, AR: Lesser

